AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 15, NO. 35. WEEKLY. | NEW YORK, THURSDAY, SEPTEMBER 1, 1892. | $3.00 per Annum. SINGLE COPIES 6 CENTS.

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Radial Drill Press with Swinging Table.

We present herewith an engraving of a machine which combines some of the essential features of a radial and of an ordinary upright drill press, embodying in its design several novel features.

The column is of the arched box girder type, with a flat face to which the arm is fitted and gibbed. The lower end of the column fits into a sleeve, which, by a flange at the bottom, is bolted securely to the bed-plate, the column swinging in this sleeve and being arranged to clamp securely in any desired position.

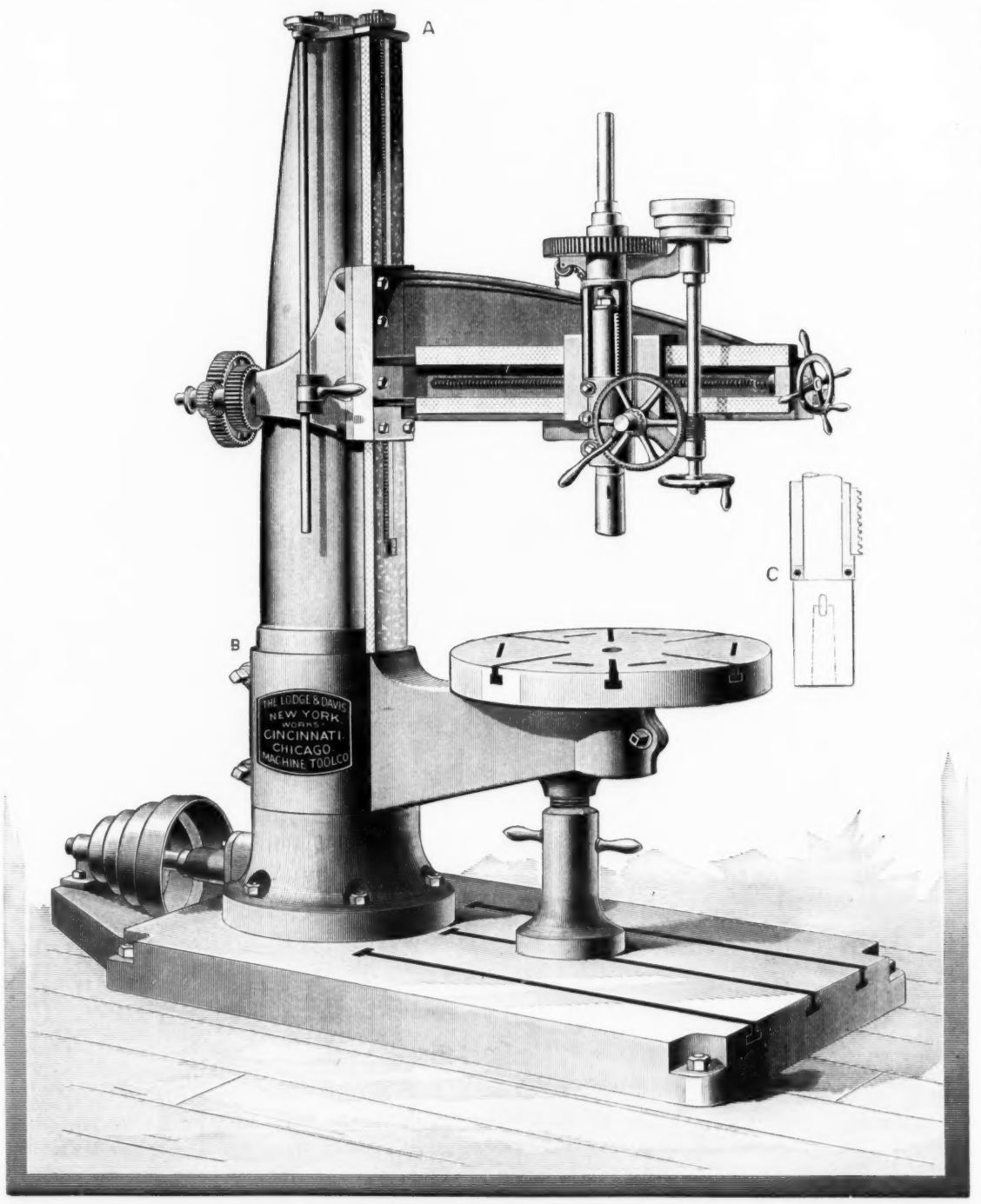
The table is supported by an arm which is fitted over this sleeve and shouldered between the column and an off-set on the sleeve. It can turn entirely around the column, and is rigidly supported by a jack which is attached to the arm, so that it moves with it, and is thus always in place and ready for use when wanted. The table can also be revolved within the arm.

Attached to the rear of the radial arm is a bracket which supports the back gears and also guides the rod by which the automatic vertical movement of the radial arm is controlled, both this rod and the back gears turning, of course, with the column.

Motion is transmitted to the drill spindle by means of a shaft which passes through the center of the column, and by bevel gears drives a horizontal shaft which passes along the back side of the arm, a sufficient reduction of speed being made at the spindle, by means of the large gear seen, to give the transmitting shafts a relatively high speed and ample power.

The thrust bearings of the elevating screw, column and spindle, denoted by *A*, *B* and *C*, are furnished with ball bearings, to diminish friction and avoid oiling. The drill spindle has power feed and quick-return movement. The traverse screw of the drill head is supplied with a small pilot wheel, instead of the usual crank, which is of great convenience to the operator for adjusting the head. If desired, the swinging arm and round table, as shown in cut, can be omitted, and the box form of table substituted, as shown on larger radials.

These drills are made in two sizes, viz., with three and four-foot arms, by the Lodge & Davis Machine Tool Co., Cincinnati, Ohio.



RADIAL DRILL PRESS.

A man in Whitehall, N. H., has, it seems, devised a spring gun from which he is able to propel something resembling the Australian boomerang in such a way that it will fly to some distance, turn, and come back.

Graphical Construction of Indicator Diagrams of Multi-cylinder Engines.

By E. THEISS.

II.

(*For cuts see page 2.*)

III. Construction of the diagrams when the receiver pressure is unknown.—In the examples considered so far it was presumed that when the first cylinder began to exhaust, connection between the second cylinder and the receiver had already been cut off. In such a case the receiver pressure may be assumed beforehand, as it may be regulated by proper adjustment of the L. P. cut-off. When, however, on opening the H. P. exhaust the receiver is still in communication with the L. P. cylinder, the exhaust steam will mix with steam of unknown pressure. For the determination of this pressure we may make use of a simple relation between the lines of compression and expansion of the two cylinders. This relation is established analytically in the following:

Fig. 7 is the diagram of a continuous expansion compound engine; Fig. 8 that of a compound engine with cranks at right angles. To simplify the calculation the volume of the H. P. cylinder is taken equal to unity. The principal points on the diagrams are denoted by figures, and the pressures corresponding by the letter p, with the different figures as subscripts. Let us take the general case where the lines of compression of the diagrams are displaced relatively to one another. The amount of this displacement is measured by passing rectangular hyperbolas through the terminal points of the compression curves next to one another (points 1′ and 4 in Fig. 8). The length intercepted by these curves on a horizontal line through the extremity of any pressure ordinate is taken as a measure of the displacement. In Fig. 8 this distance for a pressure p_1 is equal to z. Preserving the notation adopted above we can write the following equations:

For the change of pressure and volume from 1 to 2 and from 2 to 3:

$$p_1 (c_1 + 1 + r) + p_4 c_2 . m = p_2 (c_1 + 1 + r + c_2 . m) = p_3 (c_1 + x + r + c_2 . m + u) \quad (1)$$

For the change from 3 to 1′:

$$p_3 (c_1 + r + x) = p_1 (r + c_1 + y).$$

For the change from 4 to 1″:

$$p_4 c_2 . m = p_1 (c_1 + y - z).$$

Substituting from the last two equations into (1):

$$p_1 (c_1 + 1 + r + c_1 + y - z) = p_1 (r + c_1 + y) + p_3 (c_2 . m + u),$$

or

$$p_1 (c_1 + 1 - z) = p_3 (c_2 . m + u).$$

If the rectangular hyperbola passing through 3′ is continued to its intersection with the horizontal line 11′ passed through point 1, this point of intersection will be at a distance from point 1 equal to z; *i. e.*, the curves of expansion are likewise displaced relatively to one another a distance z.

For the engine with cranks at right angles the same may be shown to be true. For the change from 2 to 3 and from 3 to 4′ (see Fig. 8) we have:

$$p_2 (c_1 + \tfrac{1}{2} + r) + p_5 c_2 . m = p_3 (c_1 + \tfrac{1}{2} + r + c_2 . m) = p_4 (c_1 + x + r + c_2 . m + u).$$

Substituting into this equation from equations

$$p_2 (c_1 + \tfrac{1}{2} + r) = p_1 (c_1 + 1 + r);$$

$$p_5 (c_2 . m = p_1 (c_1 + y - z);$$

$$p_4 (c_1 + x) = p_1 (c_1 + y),$$

we shall have

$$p_1 (c_1 + 1 + r - z) = p_4 (r + c_2 . m + u),$$

i. e., on expanding in the L. P. cylinder and the receiver to a pressure p_1, a point is reached distant from point 1 a length z. This, therefore, is the displacement of the expansion lines relatively to one another.

The relation shown to exist between the lines of compression and expansion for the two cases examined is true for all multi-cylinder engines with any arrangement of cranks. It may be expressed as follows:

a. Given the case where for both the lines of compression and expansion the law $p\,v =$ constant is assumed, the distance between the compression lines measured on any horizontal line is equal to that between the lines of expansion.

b. If the law $p\,v =$ constant applies only to the lines of expansion, the compression lines being any other curves, then upon any horizontal line the distance between the lines of expansion is equal to the distance measured on that line between two rectangular hyperbolas passed through the terminal points of the compression curves next one another.

If, therefore, for any set of diagrams the

compression lines are assumed, the position of the lines of expansion is known at once.

This not only furnishes a valuable check in construction, but, as shown above, offers a ready means for calculating the receiver pressure where this is unknown. The following example shows the method to be followed in such a case:

Continuous expansion compound engine with exhaust lead in the H. P. cylinder.—In the construction of the diagram, Fig 9, the proportions are those used in the previous case. The cut-off in the L. P. cylinder is now fixed at .5. The H. P. exhaust opens when the piston has completed .95 of its stroke, and the exhaust steam mingles with receiver steam which is in general of a lower pressure. The unknown pressure existing in the receiver when compression begins in the H. P. cylinder (point *F* of the diagram) is to be found by determining the expansion line of the L. P. cylinder. To make the case general the compression lines are assumed to follow the law $p\,v'^{\cdot 2} = \text{constant}$, so that the relation stated above under *b* exists between the lines of compression and expansion. Starting from the assumed final pressures of recompression, the compression lines are plotted. A trial point *F* on the H. P. compression line is now assumed, and a rectangular hyperbola passed through it and also through points *G* and *A*, intersecting any horizontal line, as *M M* in points *F'*, *G'* and *A'*. If now *H' A'* is laid off from *A'* equal to *G' F'*, then if the trial point *F* is chosen correctly, *H* will be a point upon the expansion line of the L. P. cylinder. With the assumed cut-off *H* will give the pressure in the receiver at that instant, and this will be raised by compression in the receiver and the H. P. cylinder to the pressure which we desire to determine. It is found by projecting *H* upon the ordinate *E*, giving the H. P. piston position, *i. e.*, mid-stroke, and drawing the hyperbola through this point, its intersection with the H. P. compression line will coincide with *F*, if the latter was correctly chosen, as was assumed in Fig. 9. If the points do not coincide a second trial must be made. As the sections of the H. P. compression line that enter into the construction are necessarily short, and the deviations from a rectangular hyperbola consequently insignificant, we may, unless the trial point should prove to be much out, rest satisfied with the point *F* last determined. The construction of the L. P. expansion line is much simplified when the H. P. compression line is taken to be a rectangular hyperbola. In this case the use of a trial position of *F* is unnecessary, as the distance upon any horizontal line between the lines of expansion is at once given by the distance between the hyperbola *G G'* and the H. P. compression line.

The unknown receiver pressure being now determined, the drop of pressure when the H. P. exhaust opens is readily found. The steam then expands in the H. P. cylinder and the receiver to the end of the stroke, from *B* to *C*; here the L. P. cylinder begins to take steam and a further drop takes place, owing to the lower pressure existing in the L. P. clearance space. The lines representing the expansion in both cylinders and the receiver, *D E* and *D' H*, are drawn as before.

As remarked above, the relation shown to exist between the compression and expansion lines of a diagram affords a ready method of construction when the exhaust of one cylinder takes place before the succeeding one has ceased to take steam. The method pursued is exactly like the one first described. It may be remarked, however, that in the construction of diagrams of triple-expansion engines it is advisable to start with a terminal pressure in the L. P. cylinder, and work backwards; a better idea can be obtained under those circumstances of the compression in the different cylinders than when working on the basis of a fixed cut-off in the H. P. cylinder.

IV.—Triple-expansion engines.—Reference was had above to the desirability of examining into the distribution among the cylinders of a triple-expansion engine of given proportions of the work and the temperature ranges. The graphical methods described are easy of application, especially when the simplifying assumption is made that the compression lines, and consequently the expansion lines also, of all the cylinders form continuous curves. Diagrams having been drawn for different degrees of cut-off in the H. P. cylinder, the cut off in the other cylinders being regulated to avoid drop on the opening of the exhaust of the preceding one, the work done in the different cylinders and the fall of temperature in each, as also the total work performed, may be plotted as ordinates, the varying cut-offs in the H. P. cylinder being the abscissæ, and the curves so found will give a fair idea of the results to be expected.

Another method of obtaining volumes in compound engines.—By an extension of the principle underlying the method used in the preceding for determining the volumes swept out at any point by the pistons of the cylinders in communication, the whole volume may be found at once.

In Fig. 10 let *I* be the high, *I I* the low-pressure cylinder, the crank of the latter, having connection with the receiver, is made as shown. The cylinders are reduced to unit area, but different stroke, so that r_1 and r_2 will be the throw of the cranks Similarly the volumes of the clearance spaces and of the receiver are reduced to equivalent cylinders of unit area and of strokes $h\,c'$, $h\,c''$ and $h\,r$. When r_2 is on the center (Fig. 11) the volume between the pistons will be

$$V_o = h\,c' + h\,c'' + h\,r + r_1 + c.$$

Prolong r_1 beyond 0 to 3, and draw $31 = m$; then $m\ cos.\ u = r_2 - c$, and therefore $V_o = h\,c' + h\,c'' + h\,r + r_2 + r_1 - m\ cos.\ u$; or, substituting for the constant $(h\,c' + h\,c'' + h\,r + r_1 + r_2) = h$, we get $V_o = h - m\ cos.\ u$.

If r_2 is turned through an angle t then the volume will be increased an amount a and decreased an amount b, and

$$V_t = h - [m\ cos.\ u - a + b.]$$

The quantity in parentheses is the horizontal projection of $m = s'$, and

$$V_t = h - s' = h - m\ cos.\ (t - u) \quad (1)$$

For a single-cylinder engine the expression for the volume is $V = a + r\,(1 - cos.\ u)$ where a is the stroke of the cylinder of unit area equal in volume to the clearance space; or

$$V = (a + r) - r\ cos.\ u \quad (2)$$

On placing equations (1) and (2) side by side it appears that the volume of the steam between the pistons of connected cylinders changes, as if the steam was in a cylinder of stroke 2 *m*, the crank *m*, which may be called the virtual crank, forming an angle *u* with r_2, the clearance space being equivalent in volume to a cylinder of unit area and stroke equal to $(h - m)$.

The volumes corresponding with varying crank positions may now be obtained by aid of a polar diagram.

In Fig. 12 make $01 = r_2$; from 1 at an angle *v*, equal to the angle made by crank r_1 with a horizontal line (see Fig. 10) draw $13 = r_1$. Then 03 is the virtual crank *m*, and angle 301 the angle *u*. On *m* as diameter describe a circle, and with 0 as center, and $h = 04$ as radius, draw a second circle. Then if any radial line 06 is drawn, making an angle *t* with 04, the length 65 intercepted between the two circles will represent the volume V_t, as $65 = h - m\ cos.\ (t - u)$. The third circle, drawn upon $07 = m$ as diameter at an angle *u* with r_1, gives volumes corresponding with varying positions of crank $r_1 = 08$, facilitating the construction of the H. P. diagram.

Fig. 7.

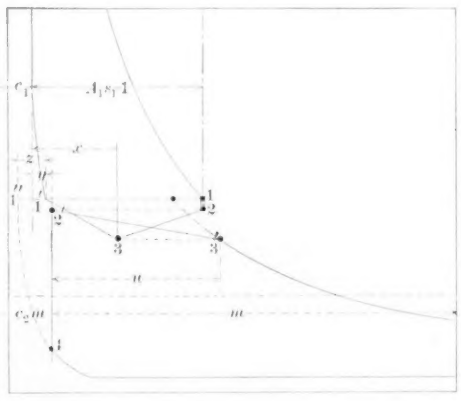


Fig. 8.

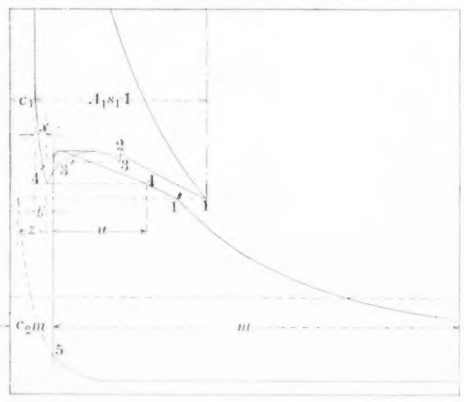


Fig. 5.

Fig. 10.

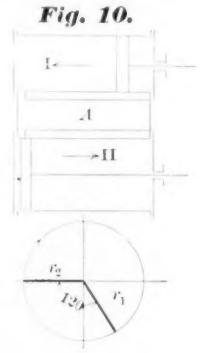


Fig. 11.

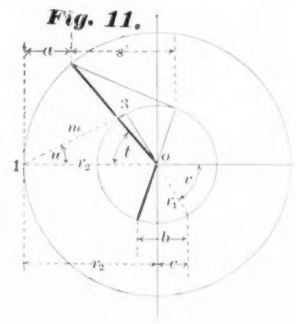


Fig. 6.

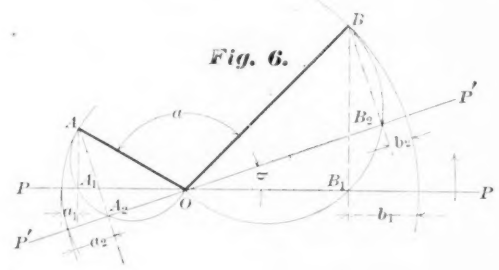


Fig. 12.

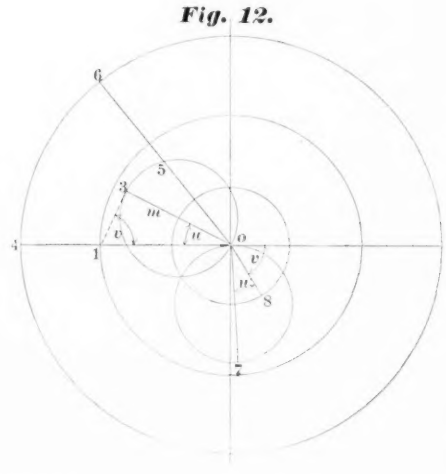
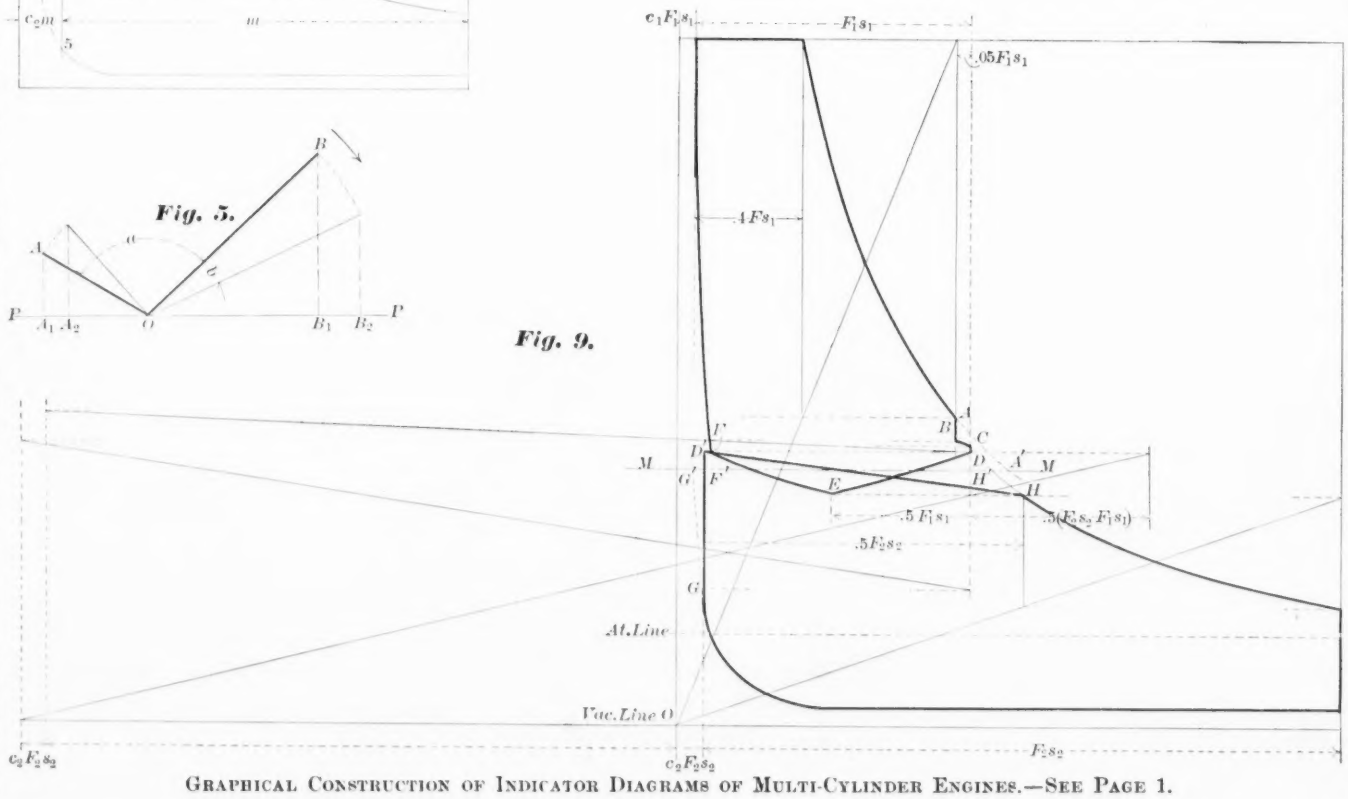


Fig. 9.



GRAPHICAL CONSTRUCTION OF INDICATOR DIAGRAMS OF MULTI-CYLINDER ENGINES.—SEE PAGE 1.

How It Goes.

A London dispatch says: "While the new cruiser 'Hawk' was leaving the Chatham dockyard to-day she gave a heavy list to starboard and went over bodily, smashing the shoring and pieces of timber into match-wood. Tremendous excitement prevailed among the workmen and spectators, as it was thought she would come into collision with the stone-work of the dock and sustain great damage. Fortunately, she was secured before she struck the stone-work, and an examination showed she had

sustained no damage beyond a severe strain. The accident was due to the fact that the vessel was unduly weighted. Her construction has cost the government £750,000."

The Overhead Trolley.

The *Evening Post* is doing good work in opposing the overhead trolley system for New York. It shows the danger of this system. It quotes from Gen. Meyer, the City Attorney of Cleveland, O., as follows:

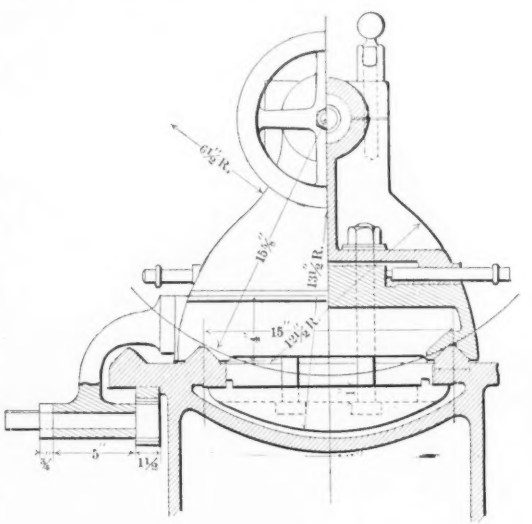
"I regard the trolley system as a very serious inconvenience and a source of constant and serious danger. I come in and go out three miles every day on the trolley cars, and I appreciate the advantages of rapid transit, but were I a citizen of New York I should very seriously consider the proposed introduction of the trolleys in that city. I certainly would not care to own any property in streets through which a trolley road passed. The wires from the poles are in danger of dropping down, and if they fell upon the occupants of a passing vehicle those occupants would be killed. I saw a trolley wire drop to the ground and there come in contact with one of the rails of the road, and in less than five minutes it literally melted down the iron of the rail."

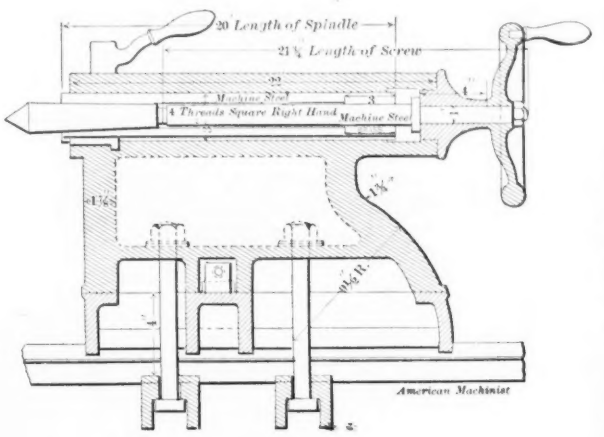
Many other quotations are made by the *Post*, of which this is a fair example.

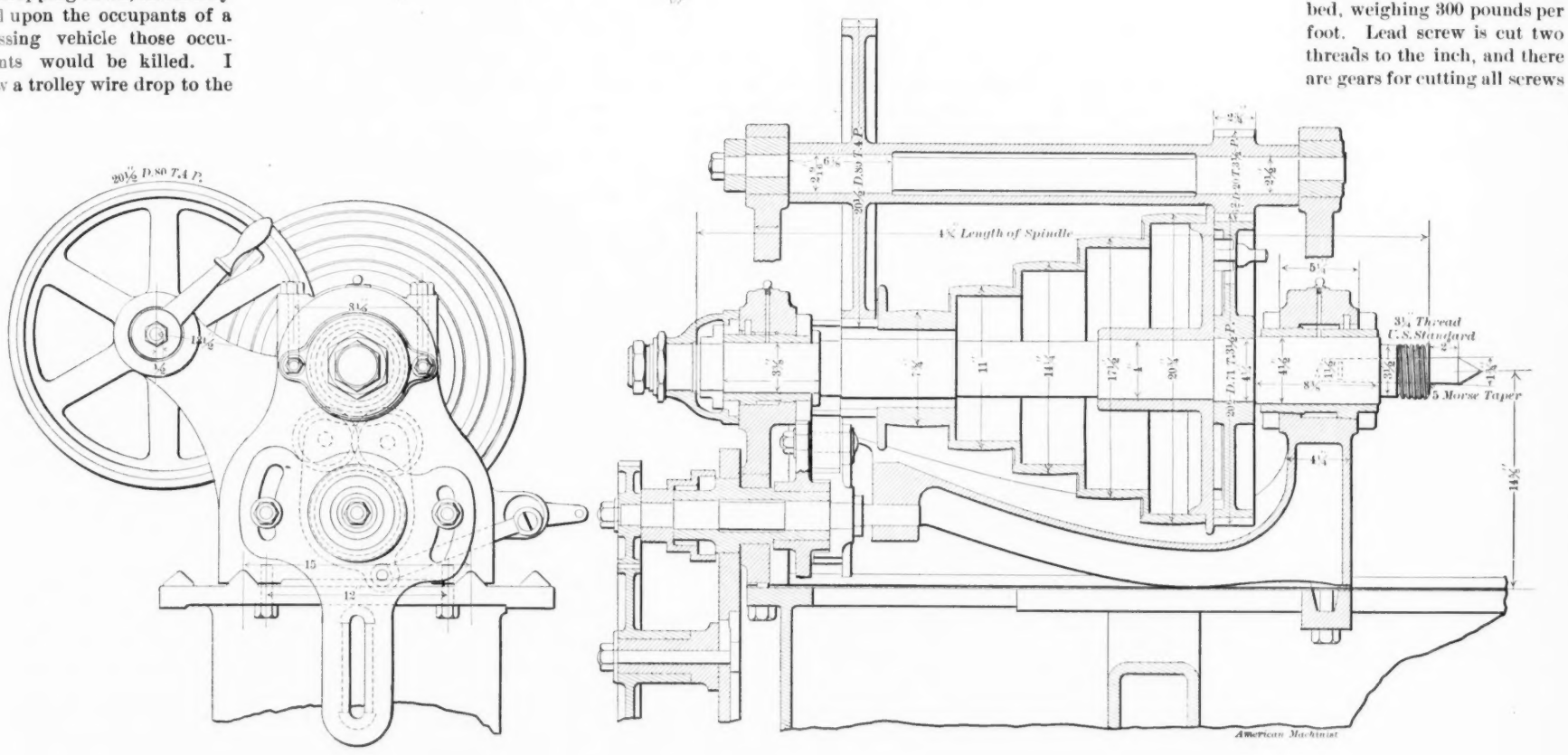
Again comes out the account of the man who has fathomed the secrets of hardening copper. He belongs in Quebec this time, and he hardens copper so as to make it more than rival steel in its cutting qualities. The extreme silliness of such statements which come to the front periodically, prevents their doing any harm.

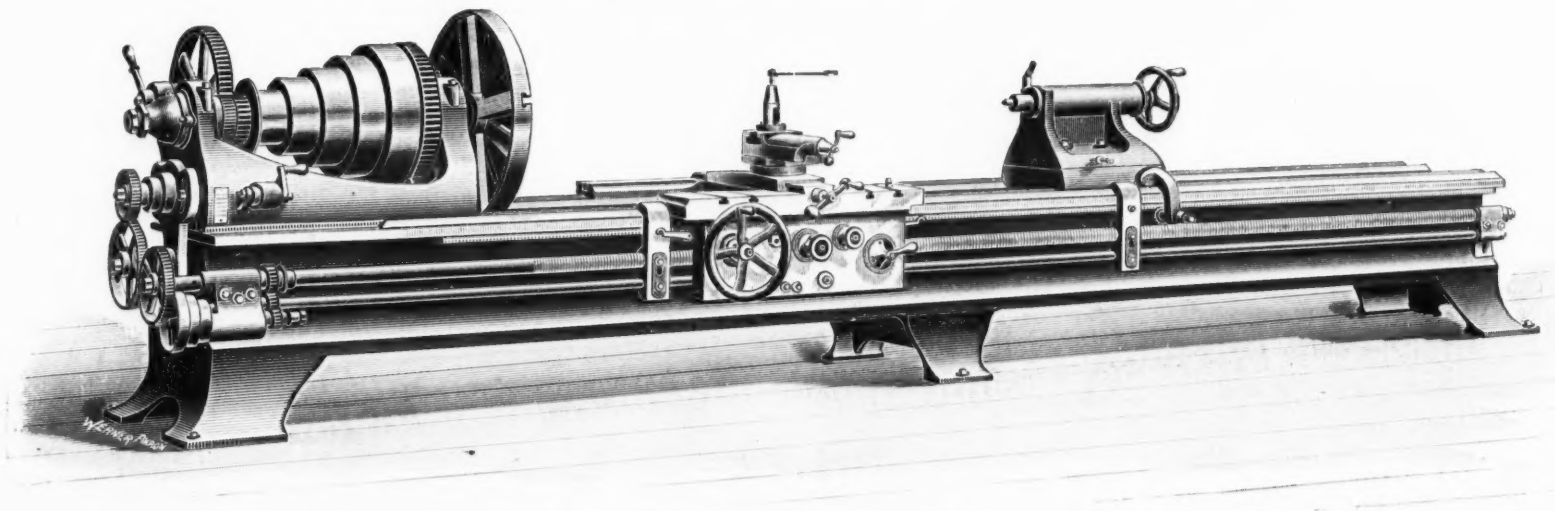
Thirty-inch "Muller" Lathe.

We present herewith a perspective view of a new 30-inch lathe which has been brought out by the Bradford Mill Company, of Cincinnati, O., and with this we also give some engravings made from working drawings, showing the construction of the head and foot-stock. The perspective engraving is made from a lathe with 20-foot bed, which is too long in proportion to swing to look well in an engraving, the lathe being better proportioned than the engraving would indicate.









THIRTY-INCH "MULLER" LATHE.

In our issue of November 26th, '91, we gave a description of a smaller lathe of the same make, the general characteristics of the two machines being much alike. The proportions of the head and foot-stocks of the lathe with the dimensions of the principal parts will be readily found by reference to the detail engravings, these showing, for instance, that the main bearing of the live spindle is 4½"x8", rear bearing 3⅝"x6". The spindle is of hammered crucible steel, runs in hard bronze boxes of such form that wear can be taken up, and they can easily be renewed. End thrust, in both directions is taken at the rear, leaving the main bearing free for expansion or contraction by alterations of temperature. Cone pulley has five speeds for a 4" belt, and the back gears are proportioned 12 to 1. When so ordered, spindle is made with 2" hole through it.

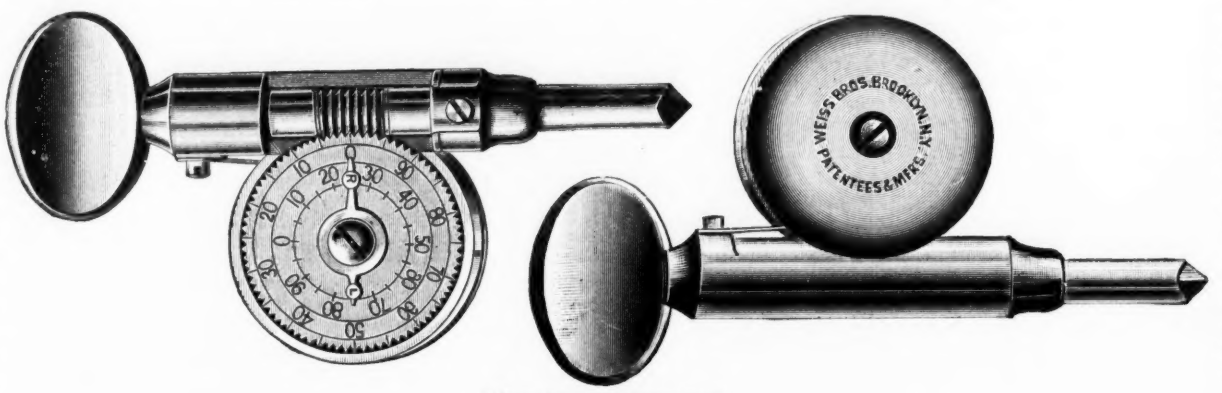
The foot-stock has a bearing on the shears 22" long, and there are four holding bolts. Spindle is 3" diameter and has a traverse of 11". Foot-stock is moved upon the bed by means of a pinion which engages with the carriage rack. The Vs are 2" wide at the base and are at 45° angle on the sides, the inner ones being 15" center to center and the outer ones 24" center to center.

The carriage is 42" long and has a bearing on the shears the full length. The feed is reversed in the head in the usual manner, and the tumbler gears, which are of steel, run on hardened and ground steel studs which are supported on both sides of the gear, insuring steadiness under the heaviest duty. There are three belt feeds, and either the screw or the feed rod may be driven by either the gears or by the belt, as may be desired, by means of the sliding gears and clutch seen in front of the lathe below the head-stock. There is an automatic cross-feed, graduated compound rest, and a taper attachment can be furnished if desired. On all lathes with beds 16 feet long and over there are supports for the lead screw and rod which follow the carriage in its movement, automatically changing from one to the other of these in the middle of the bed. The bed is 18" deep and strongly cross-rib-bed, weighing 300 pounds per foot. Lead screw is cut two threads to the inch, and there are gears for cutting all screws from 1 in 2" to 12 per inch. The lathe swings over the bed 30½"; over the carriage 20" and with 12-foot bed takes between centers 6 feet and weighs 8,500 pounds.

The mean depth of the various oceans of the world is estimated at about 12,700 feet. The average depth of the Pacific Ocean is about 1,100 feet more than that of the Atlantic. The North Atlantic and the Arctic Seas become shallow the nearer the pole is approached.

A New Speed Indicator.

We illustrate herewith a new speed indicator which seems to have some points of special merit. It consists essentially of the usual worm and wheel, the latter having 100 teeth, but in this case there is on the face of the wheel two sets of graduations. Each of these counts up to 100, and the 0 marks are 90° from each other. The numbers, it will be noticed, run in opposite directions, so that, no matter which way the shaft to be timed runs, its revolutions are indicated by simply choosing the set of numbers on the face of the wheel which suits the direction of motion of the shaft, the short pointer being used in connection with the inner row of figures, and the long one with the outer row. The instrument itself is made to indicate the proper figures and pointer, by means of a small bell or gong which is attached to it, and which in use strikes at the completion of every 100 revolutions, thus relieving the observer of the necessity of counting and keeping track of the revolutions of the wheel, and of the second hand of the watch at the same time. With this it is only necessary to keep the eye on the watch, and count the strokes of the bell until the minute is up, when the odd revolutions to be added to the hundreds counted will be indicated on the face of the wheel.



NEW SPEED INDICATOR.

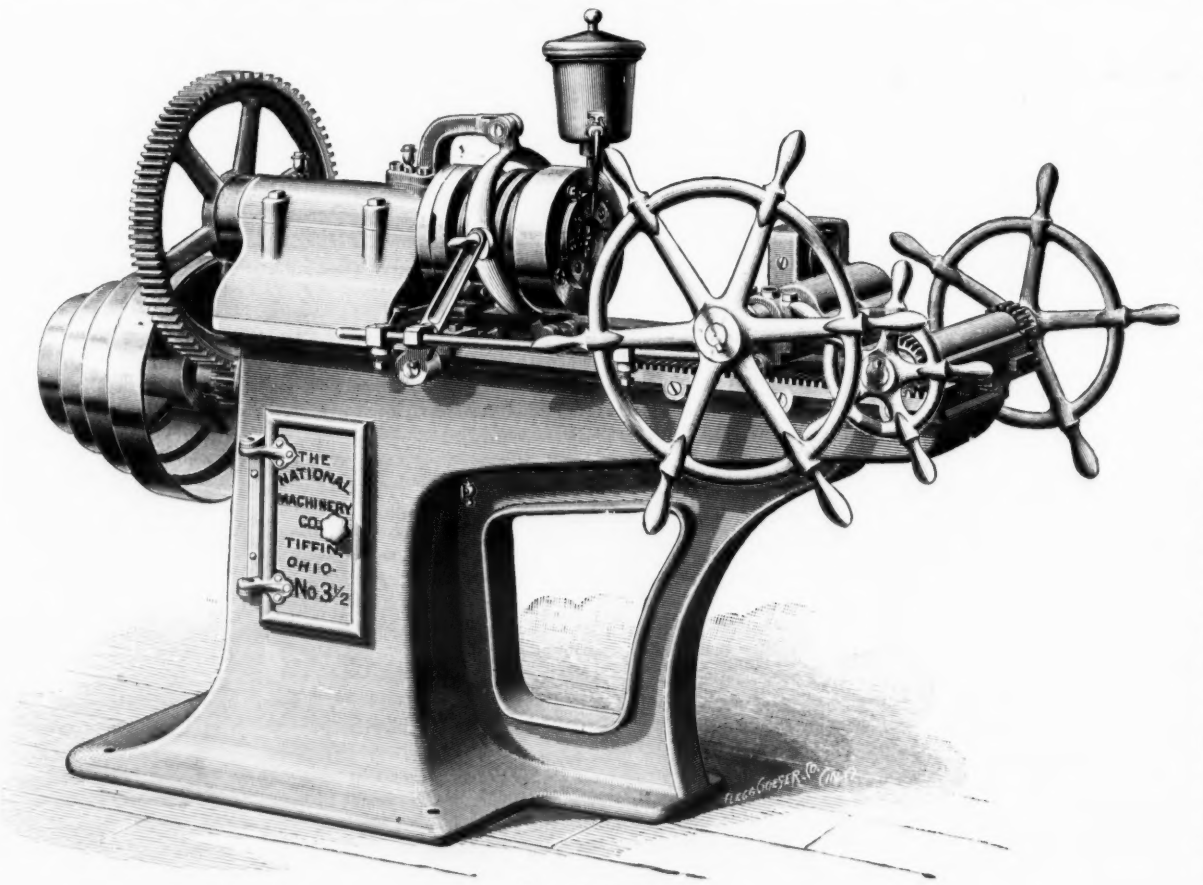
The means by which the instrument indicates the proper hand or set of figures to be used in any given case are quite simple and ingenious. On the inner face of the worm-wheel, and at a point half way between the two 0 marks, is a pin, on which there is pivoted a pawl which is arranged to swing between two stop pins, the length of this pawl and its position being such that its extreme end can swing through an arc which is equal to 90° on the face of the wheel, which, it will be remembered, is the angular distance between the two 0 marks. This pawl, as the wheel turns, comes into contact with a small spring, upon which is fixed the hammer that strikes the bell. By this arrangement, when the point is put into the center of a revolving shaft the wheel turns until the bell rings, when, upon removing the instrument from the shaft, one or the other of the pointers, depending upon the direction of rotation of the shaft, will be found over a 0 mark, and it is then known that this is the pointer to use for that shaft, and that the wheel is in proper position to begin recording the revolutions, without the necessity for turning it into position.

The instrument is well made, the wheel being of brass, and the worm of a fine quality of tool steel, with both ends hardened, the inner end, which forms the thrust bearing, running on a hardened steel plug, which is forced into the frame. The engravings are full size, the counter being small enough to be conveniently carried in the pocket. The manufacturers are the Weiss Brothers, 855–857 DeKalb avenue, Brooklyn, N. Y.

Railroading in France has been rather slow business until recently a train has been put on the route between Paris and Amiens that makes the distance of 81¼ miles in 90 minutes.

Bolt Cutter.

We illustrate herewith a bolt cutter made by the National Machinery Co., of Tiffin, O. This machine is similar in design to the other "National" machines which have been illustrated by us, but has been brought out in response to a demand for a machine having the capacity to cut bolts up to 2" diameter, but where only a limited number of that size are required, the tool being best adapted to bolts somewhat smaller. Nuts up to 2' can be tapped in the machine, which is provided with an extra large stepped pulley, heavy gearing, and with the well-known "National" head and case die, which opens either automatically or by hand. There is a pump for supplying oil.



BOLT CUTTER.

Distribution of Power.

In the president's address before the British Association he referred as follows to the subject of the distribution of power:

"The practical introduction of a system of distributing power by pressure water is due to Lord Armstrong. Such a system involves a central pumping station, a series of distributing mains, and suitable working motors. From its first introduction the peculiar advantages of this system for driving intermittently working machines, such as lifts, dock machinery, railway cranes, and hauling gear, became obvious; but with intermittent working machines, there arose the need of an appliance for storing energy during periods of minimum demand, and restoring it in periods of maximum demand. The invention of the accumulator by Lord Armstrong made the system of hydraulic transmission a success, and at the same time fixed its character as a system specially adapted for those cases where intermittent work is required to be done. Lord Armstrong's system of hydraulic distribution by water at a pressure of 700 or 800 pounds per square inch, with the use of accumulators for equalizing the variations of supply and demand, has now been widely adopted. The most extensive scheme of that kind hitherto executed is the important scheme carried out by the Hydraulic Power Company. Over fifty miles of pressure mains have now been laid in the streets of London. The Falcon Wharf pumping station contains four sets of compound pumping engines, each of 200 horse-power. Two additional pumping stations have now been erected, and 1,500 lifts are worked from the pressure mains. The minimum charge for water is 2s. per 1,000 gallons. This rate of charge is economical for such machines as lifts, but it would be extravagant for machines working continuously. It would be equivalent to a charge of nearly £50 per horse-power per year of 3,000 working hours, apart from interest and maintenance of machines. I shall indicate later on that in some cases where local conditions are favorable, where there is cheap water-power, and the possibility of constructing high level storage reservoirs, then hydraulic transmission can be adopted with success for distributing power for ordinary manufacturing purposes. But neither telodynamic transmission or hydraulic transmission have proved suitable as methods for the general distribution of motive power from central stations. Distribution by steam and distribution by heated water have both been tried in the United States, but not with very remarkable success. Only two other methods are available—distribution by compressed air and distribution by electricity.

"For many years compressed air has been used to distribute power in tunneling and mining operations to considerable distances. It is only recently that it has been used as a general method of distributing power to many consumers. In many installations the machinery has been rough and unscientific, and the waste of energy very considerable. It is through experience gained and improvements carried out in the remarkable system now at work in Paris, and known as the Popp system, that the great advantages of compressed air distribution have been proved. The Paris system has very gradually developed. About 1870 a small compressing station was erected to actuate public and private clocks by intermittent pulses of air conveyed along pipes chiefly laid in the sewers. In 1889 about 8,000 clocks were thus driven. Meanwhile the compressed air had also been applied to drive motors for small industries. The demand for power thus supplied grew so rapidly that a second compressing station was built in the Rue de Saint Fargeau. In 1889 steam air compressors of 2,000 horse-power were at work, and additional compressors were under construction. The pressure at that time was five atmospheres, and the largest air mains were 12 inches in diameter. Ingenious and simple rotary machines were used as air motors for small powers, and for larger powers any ordinary steam engine was converted into an air motor. Professor Kennedy made tests in 1889, which were communicated to this association. He found that a motor four miles from the compressing station indicated 10 horse-power for 20 indicated horse-power expended at the compressing station—an efficiency of 50 per cent. only. There were then 225 motors worked from the air mains. Since 1889 more extended investigations have been made by Professor Riedler, of Berlin, and the chief part of the waste of work has been traced to inefficiency of the air compressors. Compound air compressors of much higher efficiency have now been constructed. The plant at the Saint Fargeau station has been increased to 4,000 horse-power. A new station has been erected on the Quai de la Gare, intended ultimately to contain compressors of 24,000 horse-power. Compressors of 10,000 horse-power are already under construction. Compressed air transmission, whether or not it is the most economical system, is undoubtedly applicable for the distribution of power on a very large scale and to very considerable distances. There is nothing in any of the appliances which is novel or imperfectly understood. The air is used in the consumer's premises in machinery of well-understood types, and old steam engines can be converted into air motors without difficulty and without alteration of existing transmissive machinery in the factories. Not least important, the air can be measured with accuracy enough for practical purposes by simple meters, and charged for in proportion to the power consumed. Air compressors and air motors are not as efficient as dynamos and electric motors, but in one respect distribution by air and electricity are similar. For distances which are not more than a few miles the loss of energy in transmission is small enough to be insignificant."

A decision has been rendered against the coal roads' combination.

Fifteen-inch Forming Tool Slide.

The old method of hand-tooling irregular shapes in the brass shops has been giving way in the past few years to a much quicker and better method, by means of a forming tool variously operated. This forming tool has its upper face shaped to correspond to the contour of the finished work, the end of the tool having a cutting edge which tangentially engages the revolving blank to be formed.

The distinctive feature of the device, as here shown, is in the fact that the slide is made vertical instead of horizontal, an arrangement which gives all the room that may be needed for getting in substantial slides, and for providing all needed adjustments, without in the least encroaching upon the capacity or swing of the lathe, which, of course, is not true of a construction in which the tool passes under the work. There is also the further advantage that where, for any reason, it is advisable to take two cuts over work, it can readily be done by simply backing the cross-slide screw a little while the first cut is taken, and then bringing the slide up to the stop for the finishing cut. In cases where the blank happens to run much out of true, or where an especially accurate or smooth job is desired, this is, of course, an obvious advantage.

Fig. 1 is a general view of the slide, Fig. 2 a side elevation in section, Fig. 3 an end view, and Fig. 4 a plan of a portion of the

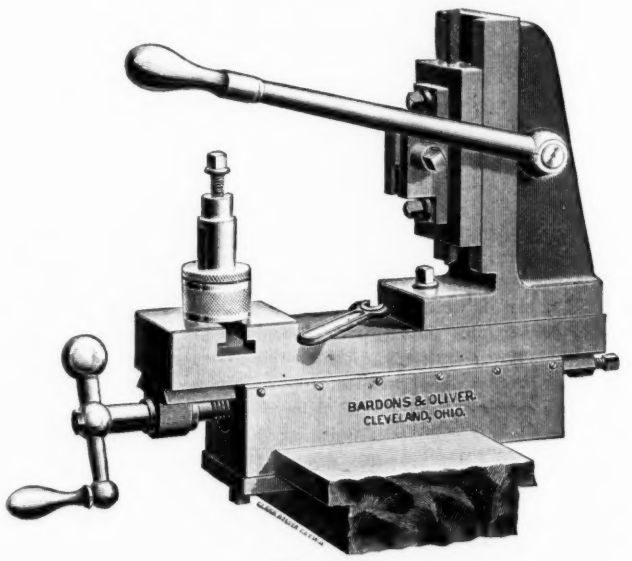


Fig. 1.

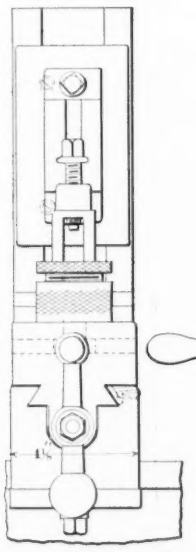


Fig. 3.

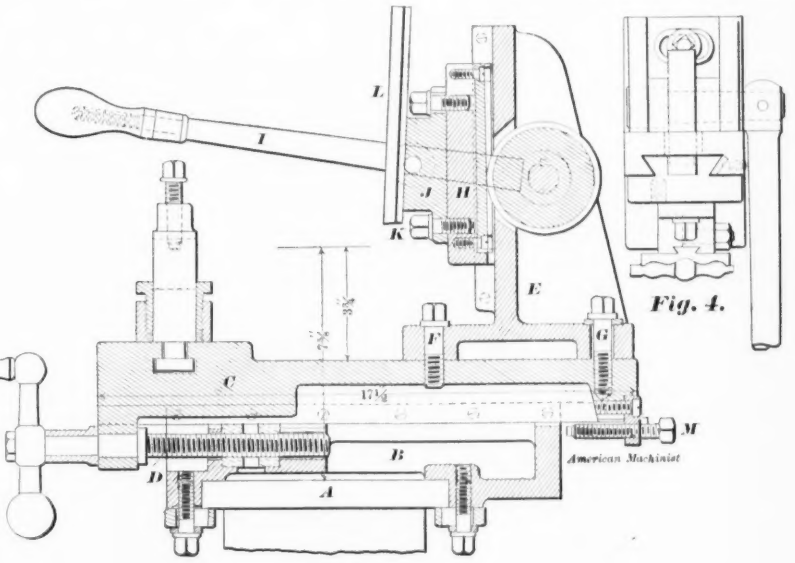


Fig. 2.

Fig. 4.

FIFTEEN-INCH FORMING TOOL SLIDE.

attachment. *A* represents the top of the lathe bed, *B* the saddle clamped to it, and carrying the cross slide *C*, which is operated by the screw *D*. *E* is a knee fastened to the slide by the bolts *F* and *G*, and swiveling upon the former, to give clearance to the tool. The knee *E* carries a vertical slide *H*, operated in this case by a rack and pinion connected with the lever *I*. This method is suitable for light and medium work, but for heavy work the slide *H* is worked by a screw. To the face of the slide *H* is fastened the tool-holder *J*. This also swivels on the screw *K*, similarly to the knee, as it is sometimes desirable to secure side clearance to the tool. *L* represents the forming tool, which is securely clamped to the holder by means of the dovetail on the back. The lower end of the tool is made on an angle, to give a shearing cut to the work.

The tool, being placed in the holder, is then brought forward to such position as will give the proper diameter to the piece to be formed. The stop-screw *M*, at the rear end of the slide, is then adjusted to conform to this position. Then by lowering slide *H* the tool engages the rear side of the revolving work. If it is found that one cut would be too heavy, the tool is backed off a trifle by reversing the screw *D*, and two or more cuts may thus be made.

This slide, fitted to a fifteen-inch machine, will form pieces as large as 4½" or 5" in diameter.

It can be fitted to any lathe, but is specially designed for the fifteen-inch monitor lathe, illustrated in our issue of February 18, which was built by the makers of this attachment, Bardons & Oliver, 1-3 Water street, Cleveland, O.

The "Fink" Mixture.

Readers of the AMERICAN MACHINIST will remember its efforts, some years ago, to expose the "Fink" mixture. These efforts were very generally successful, and still bear fruit. We are indebted to Mr. J. A. Walsh, agent for the Lewiston (Maine) Bleachery and Dye Works, for a copy of the *Lewiston Evening Journal*, from which we take the following, taking the occasion to thank Mr. Walsh for his courtesy. The *Journal*, under date of August 9, says:

UNFORTUNATE FOR FINK.

THE WAY IN WHICH MILL AGENTS IN MAINE ARE ASSOCIATING TWO MEN—A RATHER ROMANTIC STORY.

On Saturday a gentleman drove in a hack up to the office of the Lewiston Bleachery and Dye Works, in Lewiston, and alighted, leaving a lady in the carriage.

He sent in his name as J. J. Fink, and although Mr. Walsh was very busy, he found time to pay the gentleman moderate attention.

The caller had a wonderful lubricating mixture to sell. It was a secret process, and he would sell the shop rights to Mr. Walsh for $250. He had made, he said, this trip to Lewiston solely to see the agent of the Bleachery, because of the importance of a recommendation from the Bleachery throughout New England. He was about 45 years old apparently, a smooth talker, given to excessive flattery, and very much in a hurry.

After quite an argument, indicating that the mixture would save two-thirds the cost of oil, and would prevent all stains on goods, he added that he had previously called to see Mr. Danielson, the treasurer of the Bleachery, in Providence, R. I.; that he had thought well of it, and told him to come to Lewiston and see Mr. Walsh, whose judgment was excellent, and on whom he relied in all such matters, etc., etc.

"You went and saw Mr. Danielson?"

"Yes, sir."

"And he told you that?"

"Yes, sir. He told me to come and see you."

Mr. Walsh made no reply, except that he would consider the proposition, and the man came out.

Soon afterward, Mr. Walsh went up town and secured telephonic communication with Mr. Danielson, who was at Danielsonville, Conn., and he asked him about Mr. Fink.

"I sent nobody to you on any such message," said Mr. D., "and I never saw the man."

Later, Mr. Fink called and left a can of the mixture, and tried to make the trade for $100 and the savings in oil for three months.

Mr. Walsh would make no trade, made no further talk, and did not allude to the talk that he had had with Treasurer Danielson.

It is far from our wish to make any charges against the man who called on Mr. Walsh. The same man called on other agents of mills on the same mission, and was unsuccessful in making sales.

The only pertinent point is that the AMERICAN MACHINIST of September 12, 1885, March 13, 1886, April 10, 1891, April 23, 1891, and October 1, 1891, all contain articles exposing the operations of a certain other John Fink whose operations in selling shop rights to a humbug lubricating mixture they followed persistently.

The issue of September, 1885, says that the original John Fink had humbugged large numbers of the best manufacturing firms in this country out of from $100 to $700 each, mainly by showing a big lot of written contracts for shop rights to use his mixture, and a few recommendations, most of which were afterwards renounced by the parties who had written them.

He did not make sales through the mails, and had no printed matter to show. He was always in a hurry to catch the train, and always closed the contract and collected the money for the same before the buyers had a chance to investigate the merits of the mixture. When it came to a pinch various misrepresentations were made—usually when no witnesses were present.

This paper also quoted from the Detroit *News* the story of the Fink family at the leading Detroit hotel—its diamonds, the gorgeous apparel of the lady, and the ease with which the gentleman seemed to make money.

The AMERICAN MACHINIST of March 13, 1886, calls attention to the other Fink being then in the West and in Florida.

The same publication of April 10, 1891, says that the Clark Thread Co., of Newark, N. J., had just been let down by the original Fink.

The same paper, on October 1, 1891, called attention to the operations of the original Fink as his successor at that time, and says that either John Fink or some one who was pursuing Fink's original methods, and possessed the famous book of commendatory letters, had been in Pennsylvania recently, and had done some business.

The man who called upon Mr. Walsh and upon Mr. Aldrich, of the Continental Mill, and, we understand, upon several other mill agents, may have had good goods to sell and at reasonable prices; but we suggest that it is unfortunate for him, and will be a point for himself and Maine manufacturers to consider, that there is a close similarity in names, methods and business.

In the meantime, until the present Mr. Fink changes his name or uses different ways of pushing his business, Maine manufacturers will be wisely skeptical of the lubricating mixture.

It is unfortunate for Mr. Fink! We are sorry that it has happened as it has, and we call Mr. J. J. Fink's attention to the condemnatory articles upon the original Fink referred to in the above widely-known and reliable publication for the mutual benefit of Mr. J. J. Fink and of Maine oil consumers. We trust both sides will benefit by it.

A Cog-wheel Railroad Route to the Summit.

A visit to Manitou is sadly incomplete unless one has ascended to the summit of Pike's Peak by the new Pike's Peak and Manitou Cog-wheel Railroad. It is an experience never to be forgotten, and one "not to be missed for twice the cost," as is commonly said. The road is but 8.9 miles in length, or, to be exact, 46,992 feet long. The average elevation overcome is 844.8 feet to the mile, an average grade of 16 per cent. The maximum grade is 25 per cent., or 250 feet rise in each 1,000 feet traversed. The maximum grade is 16 per cent. in a radius of 359 feet. To climb such grades, engines of peculiar construction are used. The boilers are set on the trucks at an angle of 16 degrees, so that, in climbing, the average per cent. of the grade brings the line of the boiler to the horizontal.

There are four such locomotives in use upon this "short line." They weigh twenty five tons and are of the Baldwin manufacture. The drivers consist of six cog-wheels, which operate from the center of the engine on the teethed rails underneath. The wheels which run upon the ordinary T-rails are simply used to guide the engine, and not for traction. The cog-rails are made from the best tempered Bessemer steel, the teeth having been cut from the solid piece by specially-constructed machinery. There are two of these rails, set 1⅞ inches apart, weighing from twenty-one to thirty-one pounds per foot of length, the heavier rails being used on the steepest grades. Each rack rail is 80 inches long, and so placed beside its companion as to break joints. The teeth are "staggered," so as to give the six cog-wheel drivers of the locomotive perfect bearing at all times.

The utmost care was taken in grading the roadbed and laying the track. To prevent the moving or sliding of the track, which was quite possible, unless precautions were taken, owing to its enormous weight and the action of the heavy train, no fewer than 146 anchors have been firmly set in the solid rock to sustain it. These anchors are set at from 200 to 600 feet apart, according to grade. The ties are bound together by planks spiked longitudinally where the grade is the heaviest. The cars are peculiar affairs, and are pushed up ahead of the engine and detached therefrom. They can be let down grade independently from the engine by means of cog-wheel brakes. The seats are set at the average angle of the grade, at which they are horizontal, while the floor of the car is inclined from sixteen to twenty-five degrees. These cars carry from thirty to forty passengers.

The trip up the mountain is superb. It is a constant change of scene. Lovely flowers, foaming cataracts, placid streams, and frowning crags thrill the beholder as he proceeds to the regions of perpetual snow. The somber pine and silver spruce luxuriate in the shady cañons, while the aspen and willow thrive along the streams until timber line is reached. From this point up to the summit nothing but stones, scanty blades of hardy grasses, and modest flowerets are to be seen. From the summit an indescribable panorama spreads for miles on all sides; Colorado City, Colorado Springs, Fountain, Pueblo, Monument, and other towns are more or less discernible to the naked eye, while Denver may be plainly seen, seventy-five miles distant, with a good field glass. The cost of the trip both ways is but $5, or by rail up the peak and carriage descending, $6.—*Denver Republican.*

There is really no limit to the price at which coal shall sell except the limit at which the small quantity consumed shall more than overcome the profits of increased price. The whole matter is interesting as well as instructive.

LETTERS FROM PRACTICAL MEN.

Mechanical Advantage of the Screw.

Editor American Machinist:

I notice in your edition of May 26 (in your Answers to Correspondents) a question concerning the screw. I observe that you deal with the screw as a transmitter of work, say of horse-power, and obtain the efficiency of the machine; that is, the ratio of the work done to the work applied.

But with your permission, I will deal with the question as a question of obtaining the maximum mechanical advantage of the machine; that is, of overcoming the greatest resistance by the application of a given force.

It will be as well if we state the problem clearly to begin with.

Having given the length of the power arm, and the pitch of the thread of the screw, it is required to determine the diameter of the screw that its mechanical advantage shall be the greatest possible.

Let P be the power applied, W the weight or pressure overcome, m the mechanical advantage; then $m = \frac{W}{P}$.

Let b be the given length of the power arm, h the given pitch of the screw, x the required diameter, Θ the angle of the screw, and ε the angle of friction, that is, the angle whose tangent is equal to the coefficient of friction. Then it is shown in any work on theoretical statics that if P is about to overcome W,

$$\frac{W}{P} = \frac{b}{x} . \cot. (\Theta + \varepsilon) \qquad (1)$$

But $h = \pi x \tan. \Theta \therefore x = \frac{h}{\pi \tan. \Theta}$ (2)

and therefore substituting in (1) we obtain:

$$\frac{W}{P} = \frac{\pi b}{h} . \frac{\tan. \Theta}{\tan. (\Theta + \varepsilon)}.$$

But m is the mechanical advantage $\frac{W}{P}$

$$\therefore m = \frac{\pi b}{h} . \frac{\tan. \Theta}{\tan. (\Theta + \varepsilon)} \qquad (3)$$

We see from this that the mechanical advantage vanishes both when $\Theta = 0$, and when $\Theta + \varepsilon = \frac{\pi}{2}$. From $\Theta = \frac{\pi}{2} - \varepsilon$ to $\Theta = \frac{\pi}{2}$, which is the maximum limiting value of Θ; we also observe from (3) that the mechanical advantage is negative, which indicates that the pressure must be reversed for the power to overcome it; therefore from $\Theta = \frac{\pi}{2} - \varepsilon$ to $\Theta = \frac{\pi}{2}$, the screw is useless as a means of urging forward a given weight. (It may be used to just support a given weight between these limits, but cannot push the weight forward.)

It is therefore only necessary to trace the variation of the mechanical advantage from $\Theta = 0$ to $\Theta = \left(\frac{\pi}{2} - \varepsilon\right)$.

Now from (3) $\frac{h m}{\pi b} = \frac{\sin. \Theta . \cos. (\Theta + \varepsilon)}{\cos. \Theta . \sin. (\Theta + \varepsilon)}$

$$= \frac{\sin. (2\Theta + \varepsilon) - \sin. \varepsilon}{\sin. (2\Theta + \varepsilon) + \sin. \varepsilon}$$

$$\therefore \frac{h m}{\pi b} = 1 - \frac{2 \sin. \varepsilon}{\sin. (2\Theta + \varepsilon) + \sin. \varepsilon} \qquad (4)$$

Now as Θ increases from 0 to that value which makes $2\Theta + \varepsilon = \frac{\pi}{2}$, the denominator of the fraction in the right-hand member of equation (4) increases, therefore the fraction diminishes, therefore the right hand member of equation (4) increases, and therefore the mechanical advantage of the screw increases from $\Theta = 0$ to $\Theta = \left(\frac{\pi}{4} - \frac{\varepsilon}{2}\right)$.

From $(2\Theta + \varepsilon) = \frac{\pi}{2}$ to $(\Theta + \varepsilon) = \frac{\pi}{2}$, that is, from $\Theta = \left(\frac{\pi}{4} - \frac{\varepsilon}{2}\right)$ to $\Theta = \left(\frac{\pi}{2} - \varepsilon\right)$, $\sin. (2\Theta + \varepsilon)$ is positive but diminishing, therefore the fraction in the right-hand member of (4) is increasing, therefore the right hand member of (4) is diminishing, and therefore the mechanical advantage of the screw is diminishing.

Thus the mechanical advantage of the screw attains its maximum value when $\Theta = \left(\frac{\pi}{4} - \frac{\varepsilon}{2}\right)$, and as Θ diminishes from this to zero, or increases from this to $\left(\frac{\pi}{2} - \varepsilon\right)$, the mechanical advantage diminishes from its maximum value to zero.

It will be more convenient to express this result in terms of the diameter of the screw. From Equation (2) $x = \frac{h}{\pi} \cot. \Theta$. Therefore when $\Theta = 0$, the diameter is infinite, but diminishes as Θ increases from 0 to $\frac{\pi}{2} - \varepsilon$, when it has the value $\frac{h}{\pi} \tan. \varepsilon$. When $\Theta = \left(\frac{\pi}{4} - \frac{\varepsilon}{2}\right)$, which has been shown to give the maximum mechanical advantage, the diameter $= \frac{h}{\pi} \cot. \left(\frac{\pi}{4} - \frac{\varepsilon}{2}\right)$.

Thus the diameter of the screw must be greater than $\frac{h}{\pi} \tan. \varepsilon$, as it then increases to $\frac{h}{\pi} \cot. \left(\frac{\pi}{4} - \frac{\varepsilon}{2}\right)$, the mechanical advantage increases to its maximum, and then as the diameter further increases up to infinity, the mechanical advantage diminishes from its maximum down to zero.

And by Equation (3) putting $\Theta = \frac{\pi}{4} - \frac{\varepsilon}{2}$, the maximum mechanical advantage obtainable by a screw of given pitch h, of given length of power arm b, is $= \frac{\pi b}{h} \cdot \frac{\tan. \left(\frac{\pi}{4} - \frac{\varepsilon}{2}\right)}{\tan. \left(\frac{\pi}{4} + \frac{\varepsilon}{2}\right)}$.

Thus it appears that there are generally two diameters of the screw, one on each side of the diameter giving the maximum mechanical advantage, which will give the same mechanical advantage.

The lengths of these diameters are connected by a very simple law, by which, if one of the diameters be given (of course greater than $\frac{h}{\pi} \tan. \varepsilon$) the other may be at once calculated.

We showed that

$$\frac{\sin. (2\Theta + \varepsilon) - \sin. \varepsilon}{\sin. (2\Theta + \varepsilon) + \sin. \varepsilon} = \frac{h m}{\pi b}$$

whence

$$\frac{\sin. (2\Theta + \varepsilon)}{\sin. \varepsilon} = \frac{h m + \pi b}{\pi b - h m}$$

therefore

$$\sin. (2\Theta + \varepsilon) = \sin. \varepsilon . \frac{\pi b + h m}{\pi b - h m} \qquad (5)$$

Let α be the least angle whose sine is $= \sin. \varepsilon . \frac{\pi b + h m}{\pi b - h m}$, then the solutions of (5) are $2\Theta_1 + \varepsilon = \alpha$, and $2\Theta_2 + \varepsilon = \pi - \alpha$, or $\Theta_1 = \frac{\alpha - \varepsilon}{2}$, $\Theta_2 = \frac{\pi}{2} - \left(\frac{\alpha - \varepsilon}{2}\right)$, which are the two values of Θ giving the same mechanical advantage m. Let x_1, x_2 be the corresponding diameters of the screw. Then by Equation (2)

$$x_1 = \frac{h}{\pi} \cot. \left(\frac{\alpha - \varepsilon}{2}\right), \; x_2 = \frac{h}{\pi} \cot. \left(\frac{\pi}{2} - \frac{\alpha - \varepsilon}{2}\right) = \frac{h}{\pi} \tan. \frac{\alpha - \varepsilon}{2}$$

therefore $x_1 \times x_2 = \left(\frac{h}{\pi}\right)^2$.

That is, the product of the two diameters which will give the same mechanical advantage to a screw of given pitch h is $= \left(\frac{h}{\pi}\right)^2$, where $\pi = \frac{22}{7}$ or 3.1416.

As an application, let us suppose that a screw is to have ten threads to the inch, that the length of the power arm is to be the same for each screw, and that the coefficient of friction is .18 nearly, whence $\varepsilon = 10° 12'$. Then it appears from the foregoing that the diameter of the screw must be greater than .006 inch, and that the maximum mechanical advantage is obtainable only when the diameter is equal to .038 inch, and that as the diameter is thereafter increased, the mechanical advantage diminishes.

Again, if it be required to determine the diameter of the bigger screw, which shall have the same mechanical advantage as the screw of .01 inch diameter, it appears from the formula $x_1 \times x_2 = \left(\frac{h}{\pi}\right)^2$ that the required diameter is equal to .1 inch. It will be advisable for the reader to construct other examples for himself.

GEORGE M. HEWITT.

Prescot, Lancashire, England.

Machine Designing.

Editor American Machinist:

During a number of years of experience working over a drawing board it has been my fortune to be employed on work of very varying character. In addition to the ordinary routine work that any draftsman is likely to be called upon to perform, I have had occasion to make original designs for more than twenty different machines, each one of which bore little relationship to any of the others, or to any machine from which much copying could be done. As a natural result, each machine contains more or less (to me) original mechanism, for the existence of which I am personally responsible. While not all of these machines have been commercially successful, the most of them have been, and all have worked more or less satisfactorily, and very nearly as anticipated. By way of parenthesis I may add that I have at various times peremptorily refused to make designs for machines which I considered it impossible or impracticable to construct—a fact to which I ascribe a large measure of my average success.

In view of the above prefatory remarks, it might be assumed that I could tell explicitly how I went to work to produce a new machine, whether that work be called invention, or simply mechanical skill. I must confess, however, that I cannot do so, except in a very unsatisfactory manner. What I can say I intend to give for what it is worth, but with very little idea that it will be of much value to any one.

Every machine is intended to operate in some manner upon some particular article or series of articles. The first step, therefore, is to get some idea of the nature of that article, and what materials are necessary in handling it. Melted metal, a log of wood, and a piece of cotton cloth are articles not only quite different in nature, but require totally different handlings, no matter what the character of the effects to be produced upon them. It is, consequently, no small part of the success of the design to have at least a fair knowledge of the qualities of the material to be operated upon, and what the effect of certain operations are. The more thorough this knowledge the better the chances of success, and no designer should undertake the construction of a machine without having given this particular branch some special consideration. In making a machine to act in a certain way upon cardboard, I have not only examined many different qualities of cardboard under a powerful magnifying glass, but have given each successive operation the same critical examination, and the results have made many things different from what they would otherwise have been.

The next step after considering the quality of the material to be operated upon is to determine what motions must be gone through to produce these operations. It is better to conceive of these motions in the abstract, if possible. For example, the article is to be pushed here, pulled there, cut at this place, pressed at that, polished at the other, and so on to the end. Conceiving of these motions naturally gives rise to some conception of what is to come in contact with the article during these motions and manipulations, and some idea of the space occupied.

Arrived at this stage, the designer may make a few hieroglyphic sketches to represent the various movements and positions, and he may not. He will make them, however, at some stage of the progress, and usually at a time when he wants them as a record while he is considering some collateral matter. Having conceived of these various movements and their proper sequence within an imaginary space, the designer next ransacks his brain for all known ways of making them, and, selecting such as seem most appropriate, will sketch them into position together, something representing a frame or a bed-plate for holding them.

This may be considered the first sketch, and after contemplating it for a few moments he is likely to do any one of a variety of things. He may ask the person for whom he is making the design a few questions; he may go across the city to examine some piece of mechanism, or some sample of material, or have a chemical analysis or microscopic examination made, all of which would relate to the first problem—the study of the material to be operated upon, or some operations already being performed upon it.

If he is already familiar with the article and the handling of it, he may omit these things, and, using his instruments, draw out immediately what might be called the bones of the machine. Before the bones of the machine are drawn, however, there is often, nay, generally, in new machines, a large amount of fine scheming. It frequently happens that the devices at first sketched in to make the movements do not make them in the right time, or of the right character, or that for some reason they are inappropriate for the situation, or cannot be conveniently operated. If none of the familiar devices serve to produce the proper effect, then the designer must evolve some new arrangement that will. This process of evolving something new to meet a definite requirement calls out the mettle in the man. It calls for a species of mental gymnastics that not every one is capable of, and which cannot be intelligently put into words. It has been said that poets are born, not made. This may be true, but it is still more true that after they are born a great deal of making is required before they can produce the first semblance of poetry. It is very much the same in regard to the ability to produce distinctively new devices. I believe that nearly everybody is born with some native ability in this line, but only a few have had the necessary training and practice in its use.

Suppose a hypothetical case. We have the telescope and the spectroscope for investigating the celestial bodies, but neither gives us all the information we want. Required, some other instrument or means for more thorough investigation. Most persons would stop before beginning on this, but I do not believe that the problem is any more difficult than hundreds that are being solved every day, or than some I have solved myself. I would not think of undertaking it, however, as my training is not in the particular line to fit me for it.

Having schemed out the principal elements of the machine, the process of condensation and amplification should play an important part. As the pruning use of the blue pencil is an important part of literary composition, so is the weeding out of unnecessary parts an important part of machine design. As a general proposition, it is much better to make one part perform two functions than to have two parts to perform one function. The mere reduction of number of parts, however, is not always improvement Much depends upon the nature of the parts. A brick house is made of more parts than a circus tent, but the parts adhere firmly together, while the guy ropes and loose seats of the tent are eternally getting disarranged, and are a constant menace to life and limb. A large number of simple parts are often better than a less number of intricate parts.

By amplification of the design I mean that the designer should work into the machine all the necessary adjuncts and conveniences for handling, so that the entire construction will form one harmonious whole. Too often we see a machine built upon only one idea, upon which additional pieces, parts and movements have been bolted, until the original machine is only an attachment to a complicated mass of contraptions.

It is unnecessary here to speak of giving proper consideration to how the machine will be built, operated and repaired, what is convenient for the pattern maker, the foundryman and the machinist, and what kind of skilled mechanic or numskull is likely to have charge of it. All of these the draftsman will take care of, if he knows his business. There is one point, however, that otherwise good men are prone to overlook. Every detail should have a careful considera-

tion, but the minute scrutiny of a detail should not be permitted to obscure a general principle. I have seen a careful draftsman of large experience find himself apparently up against an insurmountable obstacle after an intricate mathematical calculation, and all because he lost sight of the general principle on which the machine operated. This general principle showed plainly that no calculation was needed. X. PERT.

Some Notes on Compressed Air.

Editor American Machinist:

The recent papers in the AMERICAN MACHINIST by Messrs. Booth and "Observer," on compressed air motor purposes, have been read with more than usual interest, from the fact, perhaps, that I have been scheming in that direction. Not so much, however, for supplying isolated plants with a means of power as for supplying sweltering humanity with pure cool air to breathe during a heated term like this (July 26). Air with a temperature below zero is pleasant to think of just now, and with your permission, Mr. Editor, I would like to indicate how such "a consummation devoutly to be wished for" might be consummated at least in theory.

There is a town out West that was largely piped for supplying natural gas for domestic purposes, but, owing to the fickleness of "Dame Nature," the piping and a large debt is all that is left of the enterprise. Perhaps the only good use to make of the debt would be to hang it up as an object lesson for other towns to look at, but the pipe, it appears to me, could be used for the purpose just spoken of, and what could be more enjoyable than to bar out dust, smoke and insects by closing one's room as tightly as in mid winter, and then breathe an atmosphere redolent of "new-mown hay" from first hands and at a temperature of 60° or as much lower as is wished? How is it to be done? By putting in a plant for compressing air in a maple grove on the banks of a stream near the thriving, prosperous, smoky town just spoken of. After we get the compressors in we will run enough of the delivery pipe through the stream to absorb and carry off the heat in the air due to compression (which Mr. Booth informs us, in the last paragraph of his paper in your issue of 7th inst., will be over 300° if we use a pressure of 60 pounds) before we connect to the pipe already laid for natural gas. Then in the cellar of our dwelling we have a receiver into which we admit the air and reduce its pressure to say an ounce, then from the receiver we allow it to escape into each apartment through numerous small perforations in such quantities as may be desired.

The comforts to be derived from such an arrangement of supplying homes, workshops and offices with pure cool air would be appreciated, while its importance as a sanitary or prophylactic measure could not be over-estimated. Surely pure air will command as much consideration as pure water, if not more, for we have substitutes for water, but none for air.

If anything like theoretical temperatures could be realized in practice, there would be no ice required for refrigerating purposes, provided only that the cost of compressed air does not exceed that of ice for like amounts of refrigeration.

It may be of interest here to state that a very low temperature may be produced by expanding air below what is known as "atmospheric pressure," viz., 14 7 pounds absolute pressure. For instance, if we have a vessel filled with air at a temperature of 32°, and at a pressure of the atmosphere we shall find that if we expand a part of the air in the vessel by pumping a part of it out that the temperature of the remaining air falls very rapidly. If the pump be applied till the pressure is only ½ pound absolute pressure, the temperature will be —250°. With such simple methods for producing such low temperature, it seems strange that we suffer with heat and breathe smoke and dust for three months in the year. There must be some practical objection to the use of compressed air as a refrigerant, else it had been used for such before, especially in cases where it might be taken advantage of as a by-product.

C. O. SINE.

The Eight-hour Day.

Editor American Machinist:

I notice an article in your issue of 18th inst., commenting upon the eight-hour day, and the prohibitory measures and punishments therefor, recently put in force by the government.

I am making a tour, visiting many of the leading industries in various sections of the country, and have been at the Watervliet Arsenal, near Troy, N. Y., for several days, and while there witnessed the operation of shrinking a section known as the "jacket" upon the barrel of a large gun. Their appliances for doing this are very complete, and the operation a very interesting one to witness. The jacket, after heating, is supported by a large crane and while thus suspended is critically measured for purposes of assuring its safe passage over the piece upon which it is to be shrunk. Mr. Christiansen, the head foreman of the shops, states that the piece that was to be shrank on was, in that present condition, worth $32,000, and in order to replace it, if lost by a miscalculation in shrinking (getting fast before it was entirely to its place), they would be compelled to wait one year in order to obtain a duplicate forging. The date of this operation was the afternoon of Saturday, Aug. 13, 1892, and it was their expectation to be through with the operation about 2 P. M., but the heated jacket was not expanded quite enough for safety, and it was again returned to the furnace for further heating, and as it was more than possible that the time required to complete the operation would extend beyond quitting time (5 P. M.), and in order to *comply with the law*, and likewise to have the services of these men *beyond* 5 P. M, it became necessary to put the necessary men *off duty* for a few hours intervening, so that their entire day's services would not exceed eight hours. This was done, and at about 5.15 the jacket was taken from the furnace and successfully shrunk to place, and in *compliance* with the *law* as to the "eight-hour day."

These works are certainly a great credit to the parties that have them in charge, but these worthy men are certainly foolishly handicapped in many ways that interfere greatly with their best efforts for the interests of the government. H. C. HECKENDORN.

Putting New Ribs in a Yacht.

Editor American Machinist:

It was on the west coast of Florida at the beautiful little hamlet of Bay Port.

The sailing yacht of the proprietor of the hamlet, Mr. J. W. Parsons, of Boston, was in need of new ribs.

Bay Port is a long way from any base of supplies, and offered few facilities for such a job. However, we set our wits at work and accomplished the job in first-class shape.

An inland town twenty miles distant furnished wagon wheel rims for the ribs. They were weighted and dropped in the bay to soak a couple of days.

Meanwhile William, the colored man, brought a load of old bricks, an old door, four two inch planks, a large tin can, and some pieces of gas pipe.

The door was placed on some blocks, and with the bricks a curved tunnel to receive the rims was built on it.

Near one end of the tunnel the can was placed on some bricks in the form of a rude furnace. A four inch hole in the top of the can was fitted with a wooden plug into which was screwed a nipple. An elbow and a piece of pipe connected the can to one end of the tunnel. The tunnel was then covered with earth to keep in the steam.

The four planks were cleated and strapped together strongly, leaving them smooth on one side.

The "forms" for the ribs were got by tacking together strips of thin stuff—in this case orange box "sides"—which were then scribed and fitted to the inside of the hull, leaving the thickness of the ribs all round between the edge of the forms and the "planking."

The forms were then transferred to the plank platform already built, and their shape scribed with a pencil on the planks.

A row of two-inch auger holes were bored on the inside of the curve, tangent thereto, and fitted with short plugs.

Another row of holes was bored on the outside of the curve, and far enough away to allow for the thickness of the ribs and some wedges. All being ready, the ribs were taken out of the water and run into the tunnel, the mouth of which was stopped with a board, the can was filled with water through a small hole in the plug, a fire built underneath, and in two hours the ribs were steamed soft. They were then wedged between the rows of plugs and left a day to dry.

Brass screwed through the planking of the hull fastened the ribs in place and the boat was counted stronger than when new, as the old ribs were spliced at the keel, while the new ones were continuous. If any one tries it, tell them to soak the ribs before building the tunnel, as they straighten a good deal.

BENJ. F. WILSON.

As to Planer Tools.

Editor American Machinist:

In your issue of August 4th there appears an article by Jarno, entitled, "Gascon Discourses on Shortcomings in Text-books." He says: "A chill comes over a machinist that looks at the setting of the planer tool aprons in Modern Machine Shop Practice, Vol. I pages 422 and 427; the aprons are not set at an angle so as to lift the tool away from the work when running back; this is somewhat remarkable, as Mr. Rose in a previous chapter has already given a correct cut and instructions in setting an apron. I cannot see why he should let these incorrect cuts pass on to the printer; one of my inspectors pointed them out to me. He said they set his teeth on edge, and that such setting of the apron would soon put the tool in very bad edge."

Now looking at these cuts might put the inspector's teeth in very bad edge, but I don't think setting an apron in this manner (where a tool-holder is used) will set the tool in bad edge. In fact, where such a tool holder as Mr. Rose uses in these cuts is used I am sure the tool will not be injured in the least; that which Jarno and the inspector have failed to see is that on pages 422 and 427 a tool-holder is used, and in the *previous chapter* a common tool held in a tool-post is used; in the latter case it is always necessary to set the apron over; in the former it is not, be because the tool holder shown carries a tool in the front of the holder, and there is a considerable distance between the cutting edge of the tool and the back of the holder, which, when the tool is cutting, causes it to twist instead of crowd away, and consequently cut deeper, and on the return frees itself by assuming its natural position. A side view of this tool-holder will be seen on page 411, Fig. 1,585. This form of holder makes it very convenient in planing the Vs of planer beds, and many other similar jobs, where, if the apron was thrown over, it would be necessary to lengthen the tool, etc. I have used this holder without setting the apron over, and have never experienced any difficulty with the tool such as Jarno and the inspector speaks of, and I will guarantee that any workman using it in that way, or who may see it used in that way, will never be taken with chills for having strayed out of the natural order of things. J. B. M.

The Floor of the Lick Observatory.

Editor American Machinist:

I have read with interest in your paper issued July 14, 1892, a description of the Lick Observatory, Mount Hamilton, California; but I think it only fair that a statement contained therein should be corrected. Your correspondent claims the dome and floor —"which latter is made to rise and fall, to suit the position of the eye end of the telescope"—to have been designed by Professor Holden, and the details worked out by Messrs. Dickie & Fraser. You may not possibly be aware that this arrangement is the invention of the eminent Dublin astronomical instrument maker, Sir Howard Grubb, the first page of whose catalogue I herewith forward you, with an illustration of the very floor described in the above mentioned article on the Lick Observatory. I am sure Professor Holden will be the last person to object to giving credit to whom credit is due.

F. L. WANKLYN.

Montreal, Canada.

[In mentioning this floor, the fact that Sir Howard Grubb was the first to propose or design such an elevating floor had slipped my mind, though, now that I am reminded of it by Mr. Wanklyn's letter, I am conscious of having been aware of the fact before. In the "Hand Book of the Lick Observatory," which was written by Prof. Holden, Sir Howard Grubb is credited with proposing the elevating floor, but in our conversation with him he said the design was that of the Union Iron Works, and called attention to the similarity between the hydraulic machinery and that of the dry dock of the Union Iron Works. To Sir Howard Grubb undoubtedly belongs the credit of suggesting such a floor, and it was an oversight not to have given him credit for it in the first place.

The shutters on the transit house are moved by mechanism planned by him, and he was consulted all through the planning of the observatory. F. J. M.]

Thinks There Would Be an Explosion.

Editor American Machinist:

I note in your issue of the 18th a statement that certain parties in Ohio are about to apply very large exhausting and compressing pumps to certain gas wells in that State. It should be a matter of interest to those who live in the immediate neighborhood of the pumping stations and pipe lines of these projectors, to know the means adopted to prevent the intrusion of atmospheric air into, and its admixture with the gas in the wells to which their apparatus is connected; for, in the event of such an admixture taking place, the population of the vicinage would probably find themselves suddenly at an altitude whose unpleasant indefiniteness may be suggested by the exclamation Oh! high, O!

W. F. DURFEE.

Wants to Know.

Editor American Machinist:

Can you or any of your readers give me any information about the casting of tubes in iron, something similar to soil pipe? Are such things made in the regular way, with patterns, dry cones, etc., or is there some "lightning" method, patented or otherwise, for producing such things so cheaply? I have something in view that will require that kind of work, and I should like to hear from you and your readers through your paper.

ALBION.

Mixtures for Hydraulic Cylinders.

Editor American Machinist:

One of your correspondents wants to know of a mixture of iron for hydraulic cylinders.

I would give him:

400 lbs. No. 2 iron.
300 lbs. No. 3 iron.
400 lbs. fair scrap.
300 lbs. wrought scrap.

J. R. ANDERSON.

The Chesapeake & Potomac Telephone Company is meeting with considerable trouble with its underground system in various parts of the city, and has lost a great many wires. The principal trouble lies in the grounding of the wires; that is, the wires become bared, the insulation being penetrated in some way or other, and the dampness causes the current to leak into the earth, causing what is known in electric parlance as a "ground." This prevents the use of the wires beyond the point where the ground occurs. Six or seven cables, containing from 120 to 150 wires, have been affected within the past few weeks. All of the cables affected have been replaced with new ones without the subscribers discovering that there was anything wrong.—*Baltimore American.*

Notwithstanding the immense business that has been done in the building of railway cars during the past ten years there is still such a scarcity that California finds it impossible to market her fruit product.

AMERICAN MACHINIST

Communications relating to the reading columns should be addressed to the Editor. All other communications should be addressed:

AMERICAN MACHINIST,
203 BROADWAY, NEW YORK.

PUBLISHED WEEKLY AT
203 Broadway, New York.

HORACE B. MILLER, Pres't and Bus. Manager.
LYCURGUS B. MOORE, Treas. and Sec'y.

F. F. HEMENWAY, Editor and Mech. Engineer.
J. G. A. MEYER, } Associates.
FRED J. MILLER, }

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$3.00 a year in advance, postage prepaid, in the United States, Canada, and Mexico.
$4.00 a year to Other Countries, postage prepaid.

Advertising.

Transient, 35c. per line, each insertion.
"Business Specials," 50c. a line.

The American News Company,

Publishers' Agents, New York.

DEALERS SUPPLIED BY

The Albany News Company, Albany, N. Y.
The American News Company, New York, N. Y.
The Baltimore News Company, Baltimore, Md.
The Brooklyn News Company, Brooklyn, N. Y.
The Buffalo News Co., Buffalo, N. Y.
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The Wisconsin News Company, Milwaukee, Wis.

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Subscriptions received in Paris, France, by E. TERQUEM, 31 Boulevard Hausmann, at 20 francs per annum, postpaid.

Subscriptions received in Australia by W. WILLIAMS, 17 and 21 Fink's Buildings, Melbourne.

NEW YORK, SEPTEMBER 1, 1892.

CONTENTS.

	PAGE.
Radial Drill Press with Swinging Table	1
Graphical Construction of Indicator Diagrams of Multi-cylinder Engines. By E. Theiss	1, 2
How It Goes	2, 3
The Overhead Trolley	3
Thirty-inch "Muller" Lathe	3
A New Speed Indicator	4
Bolt Cutter	4
Distribution of Power	4
Fifteen-inch Forming Tool Slide	5
The "Fink" Mixture	5
A Cog-wheel Railroad Route to the Summit	5
Letters from Practical Men: Mechanical Advantage of the Screw. By George M. Hewitt....Machine Designing. By X. Pert....Some Notes on Compressed Air. By H. C. Heckendorn....Putting New Ribs in a Yacht. By Benj. F. Wilson....As to Planer Tools. By F. L. Wanklyn and J. B. M....The Floor of the Lick Observatory. By F. J. M....Thinks There Would Be an Explosion. By W. F. Durfee....Wants to Know. By Albion....Mixtures for Hydraulic Cylinders. By J. R. Anderson	6, 7
The "Teutonic's" 528 Mile Record	8
Literary Notes	9
Questions and Answers	9
Turret Drill Press	10
Not Settled Yet	10
Manufactures	10, 11
Machinists' Supplies and Iron	11

The Teutonic's 528 Mile Record.

In our issue of 11th inst. we referred to the new record of the "City of Paris" and to that of the "Teutonic" for a single day's run, this latter record seeming upon the face of it to prove her a faster vessel than the "Columbia," which is being built for the especial purpose of overhauling any merchant vessel. It has since been pointed out, however, that the Teutonic's record was made in such a high latitude and moving in such a direction as to make the actual time from noon to noon as determined by meridional observation 24.93 hours instead of 24 hours, and that the actual speed of the vessel was therefore somewhat less than the contract speed of the "Columbia," instead of greater, even on the supposition that there was no mistake of any kind.

It will be remembered that last year the "Teutonic" claimed to have crossed in time which was disputed, some doubt being thrown upon the claims of the ship's officers by those stationed upon land, both as to time of departure from the other side and arrival at this. The incident is brought to mind by a letter received by us from the well-known engineer and manufacturer, Mr. Geo. B. Grant, of Lexington, Mass. Mr. Grant says:

"Referring to your editorial concerning the record of 528 miles run in one day by the 'Teutonic,' I beg leave to express certain doubts based on observation. I was a passenger on the ship at the time.

"We started out from Queenstown with a rush, steam blowing off every few minutes, ship shaking and wiggling with the 'screw motion,' great breakers to the right and left of the bows, screw making eighty-three to eighty-five revolutions, and everything right up to high pressure. The 'City of Berlin' was far in advance, and presently she was far in the rear. The ladies looked anxious and the pools ran on the high numbers. Mind, the pools ran high, for there's the point.

"The pool is no part of the engine, but if I mistake not it has something to do with the record. For the benefit of honest people I will explain the pool, and show its operation as well as I can from observation, not participation. There is a gambling saloon on board the ship. It is behind the rum shop, and is called the 'smoking room.' There are little tables fitted up with pots and partitions that are so convenient for smoking, and when the gamblers are tired of smoking poker they have a pool for a change, between drinks.

"The pool is a betting scheme on the ship's log for the next day. Some twenty-five numbers are sold at auction, one by one, each to the highest bidder, and the total sum received forms the pool. If you want to bet that the ship will run 503 miles during the current day, you bid high enough to buy the number 503. The log is posted the next day at noon, and if it reads 503 miles you take the whole pool and have successfully transferred many pounds sterling from other pockets to your own. If on Sunday, you are expected to show a proper respect for the day by not betting, at least not in the gambling saloon.

"Well, we started off with a rush and had splendid weather for about three days. Every one knew that we were after that record for all we were worth, and that the ship was able to take it if circumstances would so combine as to give her a fair chance. Every one was interested and noted the tremendous exertion that was being made by the eighteen thousand horse-power engines. The pools sold high.

"The log was a low one in spite of the evident hurry and extra favorable conditions. The lowest figure took the pool. Three good days and three low records. Our chances for beating the 'City of Paris' began to look slim, and pools sold low. We had a quiet run over the Banks in the fog, and a low record. Next day we had cleared the Banks and were running quietly in a fog that was almost continuous. Steam was not blowing off, but the fog whistle was about all the time. The screw motion was much less than at first. The screw was running about eighty revolutions. During the night the speed was slackened at times, so that it was not evident to the passenger in his berth that the ship was going at all. We all expected a low record for the day, but, nevertheless, it was 528 miles.

"Now, I did not take the latitude and longitude at noon every day, and therefore I do not know but that the ship made 528 miles that day. I do not say that she did make that record. But I do say that the exertion during that day was not as apparent to the observer; that the breakers at the bows of the ship were not as great; that the speed of the screw was not as great; and that the foggy condition of the weather was not as favorable as on the first three days' run.

"I also wish to express my doubts of the honesty of anything and everything that has any connection with a gambling saloon. I do not say that the ship's log was cut down a little for the first three days, and the shavings added to the last day, but I do say that the parties interested in the gambling operations would manipulate that log in just that way if by any means they could get the chance. I do not know whether the officer having the log in charge was interested in the gambling or not, but if he was so interested he could easily earn more than his salary by doctoring the record, and could do it in such a way that no one could prove him wrong.

Now consider. The ship was after the record. The record is worth a great sum to the holder. We should have got the desired figure if the engine had not broken down the evening before reaching New York. Is it reasonable that the ship would have run slow for three days and then speeded up for the last day? Was it not reasonable that the ship would make as many miles as possible at the start, to be sure of them against the chances of fog on the Banks? If the gamblers had any chance to do it, would they not work the daily log so as to fleece the lambs in the smoking room, and yet come out square with the record for the whole run? Do professional gamblers ever lose a chance to cheat? Did they have a chance in that case? (If the ship could not capture the desired record for the whole trip, was it not desirable to get it for at least one day, on the principle that half a loaf is better than none? Possibly the 'Columbia' will be able to overhaul the 'Teutonic,' after all).

"Excuse me, but I have my doubts as to that day's run."

We think the above letter is a very significant one. We do not know that Mr. Grant has had much, if any, experience in navigating ships, and probably he has had none, but he has the engineer's habit of inquiring into the reason of things and connecting cause and effect. His letter is well worth thinking about, especially by those who are responsible for the things he mentions. At first, the pools upon the day's runs of vessels included small amounts only, and served to pass the time away for many people who, being devoid of mental resources and idle-brained, must always have something going on to "kill time." But we all know that gambling operations seldom or never stop at this stage. The fever gradually rises, and the amounts staked increase until the professional gambler is attracted, and the professional gambler always operates in some such way as indicated by Mr. Grant.

It is important to the engineering world to know just what a given engine or a given steamship is capable of, and it is very much to be regretted if the professional gambler is to be allowed to becloud the subject. But on the other hand, it would be well enough for the p. g. to know, perhaps, that in meddling with something in which engineers are concerned he will in all probability have some new experiences. It is a part of an engineer's business to analyze records of performances of machinery.

There is always a certain proportion of the people in every community who find it next to impossible to look at anything whatever from any new standpoint. Roads and streets have been for a long time built and maintained for the use of those who traveled by the aid of horses, and from this circumstance there are very many well-meaning people who cannot bring themselves to think that any other use of them should be allowed, especially if such use is at all liable to "scare" a fractious or uncontrollable horse, and no matter how many people may desire to travel upon them by other means.

Comparatively few people living in cities can afford to maintain their own carriages and horses. If they travel about at all it must be on foot or by some comparatively cheap method of locomotion—may be an electric car or a bicycle. But it seems that too many carriage owners imagine that no such use of streets should be allowed, though it is, of course, in the direct line of the employment of labor-saving machinery and of the greatest good to the greatest number.

A line of electric cars was recently started in Plainfield, N. J., in the face of very determined, and, for years, successful opposition of carriage owners. One of the cars recently frightened a horse and caused a runaway, with a result, as stated, that a "test suit for damages is to be instituted." Such a suit would probably be based upon the assumption that no use of a street is legitimate that may frighten a horse, no matter if such use accommodates a hundred times as many people as are able to ride in carriages.

The bicyclists have had to fight this notion from the first, and have finally, by means of a powerful organization, established by numerous court decisions their right to the use of the highways upon the same terms as people who travel in wagons and carriages, and that drivers of horses are themselves responsible when they drive animals that cannot be controlled.

It seems altogether probable that the use of machinery of one kind and another for moving about on streets and highways will increase rather than diminish, and that the idiosyncrasies of the horse, or his individual preferences for flying pieces of paper, umbrellas and barking dogs as objects of alarm, will not be allowed to permanently obstruct this progress.

Machinery men who have devoted their attention to the production of bicycles have, it seems, taught horsemen and builders of trotting sulkies something about wheels and tires, the new pneumatic-tired trotting sulky, which, by the way, is the production of our friend, Stirling Elliott, of Newton, Mass., having demonstrated its ability to enable the trotting horse to lower the record by several seconds.

The reasons for this seem to be that the steel-tired sulky cuts into the surface of the track to some extent at least, and the substance of which the track is composed not being elastic, the force expended in compressing it at the point of contact in front of a vertical line drawn from the axle is not returned to the wheel at the rear of this line, while with the pneumatic tire the area of contact is, by the flattening of the tire, very much enlarged; the track is not scored, and the force expended in compressing the air in front of the vertical line spoken of is returned by its expansion at the rear portion of the area of contact. Solid rubber is commonly considered to be an example of almost perfect elasticity, but where the element of time enters, and it is necessary that the reaction in order to be of service should take place instantly, air is much better, as the pneumatic tires demonstrate. Ball bearings are also used on these sulkies, by which the axle friction is reduced to an almost infinitesimal quantity.

It is to be regretted that arbitration in labor disputes has proven to be a failure. But we believe it must be accounted as such. In the case of a strike or lockout, one party or the other is sure to assume that it is in the right, and hence that there is nothing to arbitrate. And so the fight goes on. One side or the other wins by "force of arms," which expression is coming to be more literal

every year, and the way for another fight is left wide open. James Otis once said, "Concession comes with better grace and more salutary effect from superior power," but there is little of this in the present day labor fights. Labor fights have come to be fights in reality, with little prospect of improvement.

Literary Notes.

RAILWAY CAR CONSTRUCTION. A Work Describing in Detail and Illustrating with Scale Drawings the Different Varieties of American Cars as now Built. By William Voss.

This book gives evidence of the author's thorough practical knowledge of car construction, and his ability of stating the subject in a clear and comprehensive manner. It treats on the construction of all classes of passenger and freight cars, including their trucks and attachments, and is elucidated by many fine detail scale drawings of car bodies, framing, floors, doors, trucks, etc., and in addition to these, complete general plans of cars are given; these are reproductions of working drawings contributed by railway and car companies. The matter was originally published in the *National Car and Locomotive Builder*, with the intention of publishing it in book form, and as now published it forms a book exceedingly handy for reference, containing much useful, valuable and practical information for all those engaged in building cars or in any way interested in this subject. The publisher has added drawings of all the standards adopted by the Master Car Builders and Master Mechanics Associations. The book should be in the hands of every engineer, draftsman or artisan engaged in this line of business. It is published by R. M. Van Arsdale, *National Car and Locomotive Builder*, Morse Building, New York. Price, $3.

We have at hand a little pamphlet entitled, SOME MORAL FACTORS IN THE ENGINEER'S CAREER. It is the copy of an address delivered by Alfred R. Wolfe, M. E., at the commencement exercises of the Stevens Institute of Technology. The address is an excellent one. In all of it we see but one point in which we should seriously differ from the views expressed by Mr. Wolfe. That is where he says: "It takes no great powers of observation to note that a given amount of energy and ability meets less money reward at the present time in engineering than in the professions of law and medicine." This we do not believe. The country, and as to that matter the world, is full of doctors and lawyers without a "case." And they have really no alternative, while at the worst the mechanical engineer can go to work at the bench or the lathe and earn a living. No doubt the fees in medicine or the law sometimes rise to a higher point than in engineering, but we doubt if the average is so high.

However, this does not essentially detract from the value of the address, which, as we have before intimated, is full of interest.

Questions and Answers.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(359) J. W. S., St. Paul, Minn., asks: What will prevent rubber gaskets from sticking to hand hole plates? *A.*—Give the gaskets a coat of common whitewash or, plumbago.

(360) L. C. B., Canton, O.; writes: I wish to case-harden iron set-screws in quantitiesof 100 to 500 or more. Will you give me full information regarding the operation? *A.*—You will find in our issues of June 23, 1888, May 22 and June 5, 1890, articles by Mr. B. F. Spalding on this subject.

(361) H. W., ——, asks: Will you give me a receipt for a metal to fill small holes in castings? *A.*—In our issue of March 24, answer to question No. 114, we have given such an alloy. The theory of the device mentioned as given by the paper is not correct and has no intelligible meaning.

(362) "Slotting Machine," Australia, asks: Can a milling machine be successfully operated with an intermittent feed, provided the feed comes on to each tooth of the cutter in succession? *A.*—We should suppose that a milling machine might be operated with such a feed, but think a continuous feed is much better.

(363) W. B, Washington, D.C., asks: Will you inform me where I can get a book giving instructions how to pass an examination for engineer's license? *A.*—There is no such book published; you must pass an examination through virtue of such a knowledge as will satisfy the examiner that you are competent for the position.

(364) P. A. J., ——, writes: I have what might be called a double crank motion, whereby two strokes can be obtained from a single wheel and pitman in one revolution of the wheel. Is there any machinery in use that will do this? *A.*—Yes; such movements are used, though we do not know that they are the same as yours. A combination of these elements with a toggle joint gives such a movement and is used largely.

(365) T. H. K., ——, asks: Has the patent on the "nickel in the slot" run out, or, if not, then whom would I have to see in order to make use of it? *A.*—This can only be determined by a search of the files of the *Patent Office Gazette*, which any patent attorney will make for you. We do not think there has been any patent covering the broad principle of the use of slots for the reception of coins, but that the patents have been granted upon special mechanisms set in operation by the coins.

(366) Q. B. C., Elmira, N. Y., writes: The question having been asked me, What should be the temperature in the smoke stack at a point just above the boiler to insure the greatest economy? I gave it up. Will you kindly give me the information? *A.*—An answer to this question involves considerations that can only apply when all the conditions are known. In one instance it might be economical that the gases escape at 500 or even 600 degrees; in another, that the escaping gases be of a temperature but little above the temperature of the steam in the boiler. The whole matter is one of compromise with conditions, and can be determined only by a competent engineer who considers everything connected with the plant.

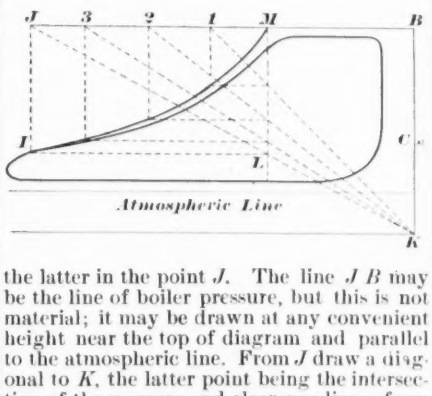
(367) C. M., Yonkers, N. Y., writes: What will be the probable gain and saving in coal if we add a surface condenser to our engine and speed her from 80 to 100 revolutions per minute? The object of changing her to a surface condensing one is that we have to pay for the water used in the boilers, and we have a stream of water close to our works, which is good enough for condensing purposes. Diameter of cylinder, 16 inches; stroke, 24 inches; boiler pressure, 85 pounds. *A.*—By making the change you will undoubtedly reduce the water tax. We cannot say what the saving of fuel will be unless we know more of the engine and the conditions under which she is working. In any case the saving of fuel will probably be very small, if any. 2. Has a higher speed any tendency to heat the bearings with the same load as before? *A.*—Yes, but the increased surface speed of the journal may still be within the limits in which the journals will not heat to an injurious or dangerous degree.

(368) J. C. D., Denver, Col., writes: I should like to have your opinion on the way a great many of our piston rods are put into the heads; the latter is reamed to a taper of about ¼ inch per foot, the rod driven in and the end riveted over. I have done quite a little engine repair work, and have found several of these rods cracked all around the riveted part, as though some sudden strain had started the piston. *A.*—There are many pistons put on the rods in the manner you describe; we believe that much of the trouble can be avoided by giving the rod at the ends less taper, say ⅛ inch to the foot, instead of ¼ inch. 2. I have also found steam passages in the cylinder whose openings in the cylinders were at least one-quarter less in area than the steam ports. Does not this impair the efficiency of the engine? *A.*—The steam port area depends on the diameter of piston and its speed, and if this area is correct the cross-sectional area of any part of the passage cannot be reduced without impairing the efficiency of the engine.

(369) O. C., Waco, Texas, writes: I am interested in a problem, but I do not know what rule to apply to get correct results. Noting your willingness to help others similarly situated I apply to you. Given a rectangular box 28x54 inches x 11 feet high. Into this box the cotton drops as it comes from the gin; as it drops in, it is pressed down by a person in the box, or by mechanical means, so that when the box is full it will hold 500 pounds. A screw on which is a follower that fits the box is now brought to bear and the contents of the 11 feet high is compressed to 30 inches. I have found that the total pressure to effect this is 4,500 pounds. Now what I want to determine is how much additional pressure will it take for every 50 pounds I add to the bale to bring it down to the same size. A rule that will apply to bales between 500 to 800 pounds will answer my present purpose. *A.*—We know of no rule that will apply to your problem. The most satisfactory way will be to get data from experiments which may point to some law from which a rule may be established.

(370) I. I. S., Jersey City, sends two sketches of screw threads. In one of these the angle which the side of thread makes with the center line of the screw is 45°, the whole included angle between adjacent sides of the threads being 90°. The other sketch is of a thread in which the first mentioned angle is 22½°, the whole included angle being 45°. He asks which thread we would consider to be 45°. *A.*—We should consider the last mentioned thread to be 45°, because that is in accordance with the usual custom in designating the angle of the sides of threads; the U. S. standard being said to be 60°, while Whitworth's is 55°, the whole included angle being meant in each case. For reasons which we have explained before, however, there is always liable to be misunderstanding when the question of angles is involved, and when an order is given or a drawing made, the angle should be plainly designated in such a way that no misunderstanding can occur. 2. Do you think that a globe valve pattern can be strengthened by putting in internal ribs between the seat and the part where the thread for the stem is tapped? *A.*—Such ribs might be put in in such a way as to strengthen a pattern, which is not right in the first place, but we do not think it would be good practice to do it in this way.

(371) R. E. H., Albion, Mich., writes: Please inform me through your columns how to find both the hyperbolic and Napierian logarithm from a common one. *A.*—Napierian and hyperbolic logarithms are names for one and the same system. Multiply the common logarithms by 2.3026, the result will be the Napierian or hyperbolic logarithms. 2. How is the hyperbolic curve constructed on an indicator card? *A.*—Select any point *I* in the actual curve, and from this point draw a line perpendicular to the line *J B*, meeting



the latter in the point *J*. The line *J B* may be the line of boiler pressure, but this is not material; it may be drawn at any convenient height near the top of diagram and parallel to the atmospheric line. From *J* draw a diagonal to *K*, the latter point being the intersection of the vacuum and clearance lines; from *I* draw *I L* parallel with the atmospheric line. From *L*, the point of intersection of the diagonal *J K* and the horizontal line *I L* draw the vertical line *L M*. The point *M* is the theoretical point of cut-off, and *L M* the cut-off line. Fix upon any number of points 1, 2, 3, etc., on the line *J B*, and from these points draw diagonals to *K*. From the intersection of these diagonals with *L M* draw horizontal lines, and from 1, 2, 3, etc., vertical lines. Where these lines meet will be points in the hyperbolic curve.

(372) M. T. P., Philadelphia, writes, and incloses a sketch of a device which resembles the mechanism by which the cross-rail of a planer is raised and lowered. The hand-crank is 12″ radius, and on the same shaft is a spur pinion 3¾″ pitch diameter driving a gear 16″ diameter. This gear is on the transverse shaft, at each end of which is a bevel pinion 4.5″ diameter, these engaging with bevel gears which are 15.29″ diameter. The screws are 1½″ diameter, square thread, ½″ lead. The weight to be raised is 10,672 pounds, and he wishes to know the force it is necessary to apply to the crank, and the rule for computation. *A.*—It would have been much more simple had you given the numbers of teeth in the various gear wheels, but, as it is, we first find out the relative movement of the screws and the first shaft. To do this we multiply the pitch diameter of the driven gears together and divide their product by the product of the diameters of the driving gears. The driven gears are 16″ and 15.29″ in diameter, and the drivers are 3.75″ and 4.5″ diameter. Performing the operation indicated above the result is 14.49, which shows that when the screws make one revolution the crank makes 14.49, or practically 14.5 turns. When the screws turn one revolution the weight is raised .5″, and we have only to find the proportion between this and the circumference of a 24″ circle—in which the applied power moves. The circumference of a 24″ circle is 75.4″, and the proportion then is 75.4″ : 10,672 = .5″ : *x*. Solving this proportion we have for the weight necessary to establish equilibrium 70.7 pounds. A force of 71 pounds would therefore move the weight slowly if it were not for friction, and the amount of allowance to make for friction will depend upon the construction and workmanship. For ordinary construction we should allow 50 per cent, which would make the required force 142 pounds. The friction may, however, with some constructions or by neglect of lubrication, exceed 50 per cent., and in computations for strength of parts allowance should be made for this.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

It is a fact. See Grant, p. 20.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Forming Lathes, Mer. Mach. Tool Co., Meriden, Ct.

Ideal Drawing Stands. M. C. Hammett, Troy, N.Y.

A. D. Pentz, Consulting. Tools. Elizabeth, N. J.

Tool Holder: Armstrong Bros. Tool Co., Chicago.

New lists of cutters. Brown & Sharpe.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

"The Bulldozer," a new departure: forging by pressure. M'f'd by Williams, White & Co., Moline, Ill.

Pattern and Brand Letters. A variety of sizes and styles Heber Wells, 8 Spruce St., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N.Y.

S. A. Smith, 23 S. Canal St., Chicago, Ill., is agent for Holbrook's new loaded rawhide mallets.

Automatic Gear Cutters. Best in the market. Superior Machine Works, 106 Canal St., Cleve'd, O.

Pulley lathes, most efficient offered. Ohio Machine Tool Works, Cincinnati, O.

J. S. Thurman, M. E., Indianapolis, Ind., Expert Patent Solicitor. Inventions Perfected.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Most sensitive and durable Damper Regulator made; works within one pound. Send for circular. T. Kieley, 11 W. Thirteenth Street, New York.

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., cor. Canal and Washington Sts., Chicago, Ill.

Patterson, Gottfried & Hunter, Limited, 146-150 Centre st., New York, are putting on the market a new alarm speed indicator. Send for circulars.

25″, 32″, 37″, 42″ — "Only Drill Press built on 'Ko-rekt' principles, Even if they come from Jersey." Gould & Eberhardt, Newark, N. J.

S. W. Card & Co., Mansfield, Mass., are putting on the market a new line of stocks and dies, with their patent adjustable dies and guide. S. A. Smith, 23 S. Canal Street, Chicago, Ill., Western Agent.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases,
31 Nassau Street, New York.
Send for Brief History of Patent Legislation.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUBLISHING CO., 205 Broadway, New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

One of the principal features of East Oakland, Cal., is Joe Sullivan. He is a member of the Brooklyn Hose Company and measures over seven feet in height. People who go to Oakland are apt to be startled when they see one of San Pablo cable cars with a pair of feet on the step and a head peeping over the top of the car, the body being hidden from view. But it is only Joe Sullivan, the East Oakland giant. As for getting inside of a car, that is impossible. He is compelled to stand on the platform, and then his chin would be on a level with the roof of the car.

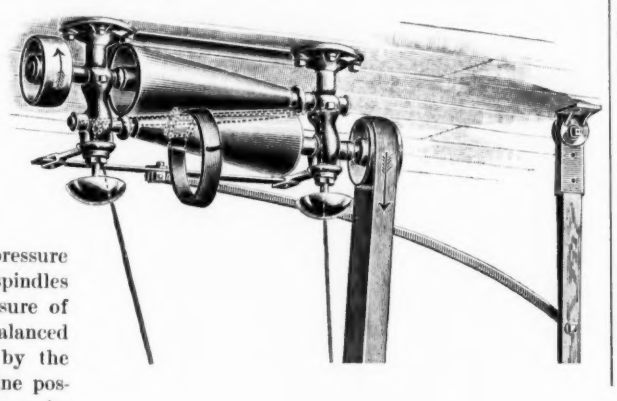
When an alarm of fire calls him down town there is always more of a crowd around Joe's hose cart than around the fire. He towers above everybody and the horses look like pigmies alongside of him.

But with all this Joe is modest and retiring. He feels his immense height and is very sensitive of the notice that he attracts.

He has received many offers from circuses, dime museums and shows; but Joe refused them all. He would rather work as a substi tute in the Oakland Fire Department and continue to do duty as a human hook and ladder than travel with any show.—*Fireman's Herald.*

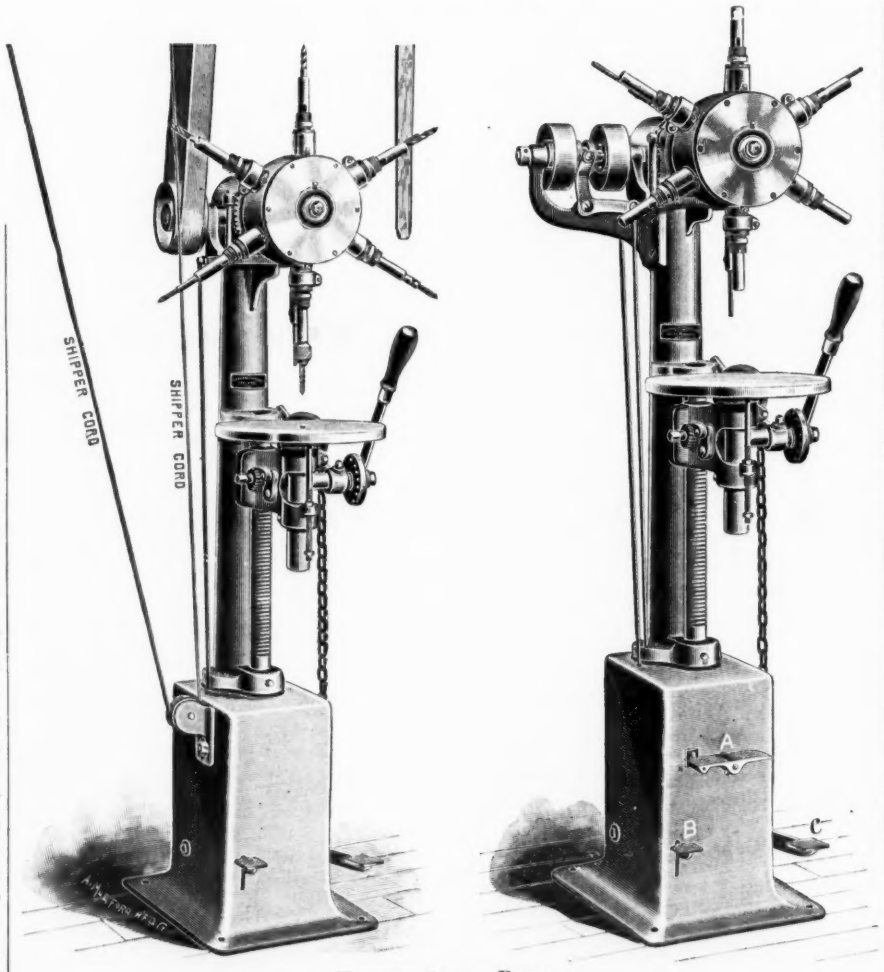
Turret Drill Press.

In our issue of December 10, '91, we illus trated by perspective and detail sectional engravings a new drill press, in which there were six spindles driven by double friction gearing, the revolving turret in which these spindles were fixed being placed eccentrically to the shaft upon which the friction gears were placed, so that all the friction pinions attached to the spindles were free of the gears, except when in position for work, and the only spindle revolving at any one time was that one which was in use or in position to be used. It will be remembered, also, that there are two beveled friction gears within the turret, which are driven in opposite directions, by means of which all side thrust or pressure upon the bearings of the spindles is avoided, since the pressure of one gear upon one side is balanced by that upon the other by the opposing gear. The machine possesses many features which make it valuable for many kinds of manufacturing operations, and, since our illustration of it, has met with a very favorable reception in the shops of this and European countries. We now give illustrations of special arrangements of the machine which have been found useful in many cases. The smaller engraving shows the press as arranged for tapping, the cone pulley being replaced by two friction clutch pulleys which are driven from above by the usual open and crossed belts, the clutch being operated by the rocking treadle *A* at the front of the base of the machine, leaving the hands entirely free to handle the work.



Treadle *B* withdraws the locking pin from the turret, allowing it to be revolved until automatically locked in the succeeding position, while treadle *C* is attached to the lever operating the table.

The larger engraving shows the machine as arranged to be driven by an "Evans" friction cone, which, as will be seen, consists of two cones, between which is placed a short endless belt or band of leather, which is compressed between them, and by its frictional engagement with them transmits motion from the driving cone to the driven one. This band passes between the forks of an ordinary shifting device, and is thus moved along while running, to give any desired speed to the driven cone and the machine. In this case the shifting is arranged to be done by the cord shown, and thus any speed required for the various tools in use is instantly available, the range being from 250 to 2,000 revolutions per minute. The machine is started or stopped by the shipper at the right, which operates to turn two eccentrics which are placed under the boxes supporting the lower or driven cone, which is thus moved vertically, to bring the band into contact or to release it, as may be desired. The machine is suitable for drills from the smallest size up to ½", and each drill or other tool used has an independent stop for depth. The manufacturer is A. D. Quint, Colt's West Armory, Hartford, Conn.



TURRET DRILL PRESS

The Philadelphia *Press* tells the following story of President McLeod: "Before A. A. McLeod became Reading's president he was in the habit of visiting the different stations on the road for the purpose of inspection. Once he came into a little stopping place where an old woman with a number of baskets was bewailing the non-appearance of a train to take her to market in the city. Mr. McLeod assured her that no trains came that way for Philadelphia, but she persisted that her ticket had been bought from an official upon a distinctly opposite understanding. 'That alters the case,' said Mr. McLeod. 'The road must not act in bad faith with any one.' An engine was telegraphed for and coupled to a passenger car; it rushed the woman to Ninth and Green streets in a trice."

J. W. Wood, secretary of the Corliss Association of Stationary Engineers, of St. Louis, Mo, writes us regarding the St Louis Exposition:

"The Corliss Association of Stationary En gineers have secured space in the great St. Louis Exposition (in Machinery Hall) for display of steam specialties and supplies, or anything that is of interest to engineers. The Corliss Association desires to keep abreast with the times; they expect to have a 11x14 Buckeye engine to run a 300-light dynamo to light our display, also goods manufactured by the following firms: Laidlaw & Dunn Pump Co.; Dean Pump, Holyoke, Mass.; Worthington Pump Co.; Garlock & Crandall Packing Co.; Crane Co. and Van Auken, steam specialties. Coons patent grate bars; Bauer feed-water heater and purifier; Dodge Wooden Pulley Co.; Reeves Pulley Co.; Air Space Pipe Covering Co.; Leonard & Ellis Oil Co.; Standard Oil Co; Reliance Alarm Gauge Co.; Williams clutch pulley; and good support from the St. Louis houses. The exposition opens September 7, and continues forty days All manufacturers invited to display anything of interest to engineers; costs only to place your goods in St. Louis and in position. The association will have men in attendance during the exposition."

Jay Gould's yacht, the "Atalanta," which is said to have cost $500,000, is for sale for $200,000. It is said that this steamer requires a crew of fifty men, and, altogether, is a very expensive toy, fixing her up for a race having cost $18,000, while the bill for repairs, after colliding with a tug-boat, was $20,000. It is said that Wall street is having its little joke about the matter by declaring that Gould is too poor to keep up the yacht.

Not Settled Yet.

The Tennessee board of prison inspectors have made two resolves: First, that they have no authority to accept the voluntary surrender of the lease of the convicts; and, second, that the State shall see that its part of the contract with the lessees be carried out.

This means that the convicts will be set to work again as soon as possible at Coal Creek, Oliver Springs, Inman and Tracy City. It means also that a standing army will be necessary at each of these places. It means that the State of Tennessee will have to pay out for military purposes a good deal more than the $100,000 it receives every year for the lease of the convicts. It means that there will be more trouble just as soon as the free miners have recovered a little from their recent defeat, and that public opinion in East Tennessee, turned against them temporarily by their lawlessness and violence, will soon be on their side again.—*Mail and Express.*

The above is a fair statement of the case. Public opinion will continue on the side of the miners until the abuses in the contract system are remedied, and there will be no end of trouble until this is brought about. It will require more than one soldier to keep a convict at work in Tennessee, and after a time the State, or those who pay the taxes, will begin to grumble at the expense. The whole thing is a great deal worse, so far as the negro is concerned, than the former system of slavery, and can never stand under the present civilization.

On Monday an engine driver in the Duke of Sutherland's estate yard at Trentham got his arm broken in the machinery, and Thomas James temporarily took his place. On Tuesday James was doing what has more than once proved a most dangerous thing, namely, showing another workman how the accident occurred, when he himself was dragged into the machinery and mangled beyond recognition.—*The Engineer.*

The last advance in the price of anthracite coal makes up, we believe, a total of one dollar per ton. As we predicted when the combine obtained control of the products of the earth, and the people, in respect to fuel production and distribution the price has been increased with mathematical regularity. And so it will continue.

MANUFACTURES.

Mt. Baker Shingle and Manufacturing Company, of New Whatcom, Wash. Capital stock, $5,000.

The Novelty Manufacturing Company, at Newmarket, Ont., has increased its capital stock from $12,000 to $25,000.

Geo. A. Stuck and Chas. L. Hartsfeld are the incorporators of the Southern Steel and Aluminum Alloy Company, Newport, Ky.

The Lumpkin Mill Company, of Butte County, will be reincorporated with increased capital, and a new mill company constructed in the Fall River district.

Lovell Manufacting Company, Limited, Erie, Pa., issue a list of dynamos and electric motors made at the works. The catalogue is illustrated, and will be found of interest.

James Oldfield, former foreman in the Port Blakeley Mills, has erected a new saw-mill at Granite Point, Wash., and will cut 3,000,000 feet of lumber for the Great Northern Railway.

A petition is being circulated at Auburn, Neb., asking the city council to submit to electors a proposition to issue bonds to build a system of water-works. The petition will probably prevail.

The Natchez Water Supply and Sewer Company, of New York City, has been incorporated in West Virginia, with a capital stock of $300,000. Its purpose is to construct water and gas works, sewer system, etc., at Natchez, Miss.

W. W. Hamilton, Joseph Richendofer and Charles Imhoff expect to put in a shingle mill at Custer Station, Wash. They expect to build a mill with a capacity of 100,000 feet per day. They are clearing the ground and preparing to build it.

The Trumbull Manufacturing Company, of Warren, O., formed for the manufacture of saw-mills, engines and general machinery, have taken the plant of the Warren Machine Works.

Brouillard & Jones Tool Co., 275 Main street, Springfield, Mass., is a new concern just starting in to manufacture dies, punches and special tools. They have bought considerable fine machinery, but expect to need a good deal more. They expect to employ 25 to 30 men.

Goldens Foundry and Machine Company, Columbus, Ga., has issued a new catalogue and price list of shafting, hangers, pulleys, boiler fronts and numerous other things made at the works. The cuts with which the catalogue is illustrated appear to show an excellent line of manufacture.

The Vulcan Iron Works, Wilkesbarre, Pa., are building, as an addition to their shops, a boiler shop 80 by 150 feet, to meet their fast growing trade. The blacksmith shop will be increased 50 by 100 feet, and the foundry will be extended 50 feet, as business has increased to such an extent they are cramped for room.

The Southern Electrical Mfg. Co., of New Orleans; The Brown & Sharpe Mfg. Co., Providence; The Ball Electric Co., New York City; The J. H. & D. Lake Co., of Hornellsville, N. Y., and F. B. Fargo, Lake Mills, Wis., are among parties who have recently added Bowsher's balancing ways to their machine shop equipments.

A new pipe line from the oil fields to the east is to be constructed, papers having been signed which insure the completion of the line, which will be a formidable rival of the Standard Oil Company. The pipe line will be 212 miles long, will run from Bradford, Pa., to Newburgh, on the Hudson, where the oil will be refined, and will cost $12,000,000.

The Betts Machine Company, of Wilmington, Del., have just shipped one of their heavy 14-foot boring and turning mills, weight 120,000 pounds, to the Pennsylvania Iron Works Co., Philadelphia, Pa. This concern already has a 14-20-foot Betts mill in use, day and night, but have lately taken many new contracts, and a new mill was necessary.

The Egan Company, the well-known builders of wood-working machinery, Cincinnati, Ohio, has issued a mammoth catalogue, a perusal of which will give an idea of the immense line of work that the company undertakes. This company understands the value of good cuts, and as a result of such understanding the catalogue is very finely illustrated.

A. D. Quint, of Hartford, Conn., the inventor of a six-spindle turret drill press which we have previously illustrated, writes: "I have received inquiries from all parts of the world, and made sales in Germany and Belgium. Almost invariably they refer to the AMERICAN MACHINIST." The point is that Europe furnishes good ground for the sale of American machinery, if its merits are properly shown."

The Berlin Iron Bridge Co., of East Berlin, Conn., will design and build the new buildings of the New Orleans & Carrollton R. R. Co., at New Orleans, La. The power house is 83 feet wide by 130 feet long, with brick walls and an iron roof. The car shed will be built entirely of iron, 130 feet wide by 140 feet long. It is the intention of the N. O. & C. R. R. Co. to have the finest electric railroad plant in the Southern States.

The National Water Tube Boiler Company, of New Brunswick, N. J., have just completed a shipment of their boilers to the United States Electric Lighting Co., Washington, D. C. Fifteen large freight cars were required to transfer the boilers. This

steam plant will be a duplicate of that furnished the same company last year, and when erected the full boiler plant will be among the largest in use in electric light stations in the country.

There was talk at Youngstown, O., of raising funds by subscription to make up to the newly organized Ohio Steel Company the difference between the cost of a site in the city and one outside the city for their new works. Only $2,000 was raised, and the promoters of the new company asked that the effort be abandoned. The plant will probably go to Struthers or to some other advantageous point outside of Youngstown.

The Board of Water Commissioners at Port Huron, Mich., will receive proposals until Sept. 15, for furnishing and placing in position in the south pumping house at the pumping station, one high duty compound condensing engine capable of discharging 12,000,000 (U. S.) standard gallons of water every 24 hours against a pressure of 140 pounds to the square inch, with a steam pressure of 75 pounds to the square inch. Proposals to include the building of all foundations with extensions and connections and tools, etc., necessary for the care and the handling of the engines and pumps. The proposals are also restricted to an engine now in successful operation.

John McDonald, mayor, Austin, Texas, opens bids Sept. 1, for pipes, valves, head-gate frames, turbines, castings and pumps as follows: 1,290 lineal feet of 9 feet diameter plate iron Penstock pipes; 1,180 lineal feet of 9 feet diameter plate iron Penstock pipes; 130 lineal feet of 7 feet diameter plate iron Penstock pipes; 265 lineal feet 5.5 feet diameter plate iron Penstock pipes; 13 stop valves for 5 feet 6 inch diameter pipes; 9 sets of head-gate frames and guides; 4 pairs of horizontal turbines of 506 horse power, under 60 feet head; 2 vertical turbines of 185 horse-power under 60 feet head; 10 cast-iron quarter turns for 5 feet 6 inches diameter pipes; 70 tons of rack irons; 2 pairs of 4,000,000 gallon hydraulic pumps.

Henry Lister & Son, of Huddersfield, England' are closing up their works there and have bought 15 acres of land near Jamestown, N. Y., where they are erecting a factory for the manufacture of silk plushes and other goods, in which 400 hands are to be employed. In time they expect to give employment to about 2,000, as they intend to add yarn spinning to their lines of manufacture, if present conditions remain unchanged. They have brought most of the machinery with them which they have been using in England, but expect to require much additional machinery, which American manufacturers, if not already prepared, ought to prepare themselves to furnish. This concern employed 1,200 hands in England. Their main factory will be of brick, 180 x80 feet, 4 stories high, with dye house, engine and boiler house, warehouses and other necessary buildings.

Allston is to have a new industry in the shape of a factory for the manufacture of insulated magnet wire. The Boston Electric Company are now placing machines in the building formerly occupied by the Samuel Hano Company, on Braintree street. The establishment will be equipped with about 600 insulating machines, of which Mr. James Buckner, a resident of Allston and a member of the company, is the patentee. Besides these are two frames with forty spindles each, for winding cotton and silk on large spools There will also be a braiding machine and a paraffining machine. The insulating machines are entirely different from any other now used in this work, as they will insulate a finer wire, and have a capacity of from 4,000 to 5,000 revolutions an hour. It will be a number of weeks before the factory will be in running order, as the machinery is being made especially for it. When in working order it is estimated that the capacity will be as follows: No. 18 wire, $\frac{1}{8}$ of an inch in diameter, will be turned out at the rate of 70 pounds a day; for No. 25 wire it will take a machine two days. For the insulation of one pound of No. 25 wire only one-half ounce of silk will be used.—*Boston Daily Traveler.*

For some time several Cleveland gentlemen have been investigating the manufacture of woolen goods. Among them is Bentley Bamforth, who for the past five years has been the superintendent of the Northern Ohio Woolen Mills, on Pleasant street. The question of the advisability of starting a new woolen-mill in Cleveland was given a great deal of attention by these gentlemen, and some time ago was practically settled. Preparations were commenced, the commission for drawing the plans for the buildings being given to Walter P. Rice. The plans have been completed, and show that the works will be extensive. The main building will be 74x41 feet in dimensions and two stories in height. At the rear there will be a one-story L 117 feet long and 33 feet wide. In addition there will be a one-story building 47x38 feet in size. The buildings will be constructed of brick. The estimated cost of the proposed building is $12,000. They will be so constructed that additions can be made from time to time as desired. The mill will be near the intersection of Forest street and the Erie railway tracks. The bids for the construction of the buildings are already in and will be considered at a meeting to occur in the Forest City House this morning. As soon as the buildings are completed necessary machinery will be put in and operations will be commenced. The capacity of the mill will be about 2,000 pounds of shoddy per day.—*Cleveland Leader.*

Machinists' Supplies and Iron.

NEW YORK, August 27, 1892.

Iron—American Pig—We quote Standard Northern brands, No. 1 Foundry, $15 to $15.50; No. 2, $14 to $14.50; Gray Forge, $13 to $14. Southern brands of good quality are obtainable at $14.25 to $15 for No. 1 Foundry; $13.50 to $14 for No. 2; and $12.75 to $13.50 for Gray Forge.

Scotch Pig—Coltness is quoted at $21; and $20.25 for Eglington.

Antimony—We quote L. X., 11¾c. to 11¾c.; Cookson's, 12¾c. to 12⅞c.; Hallett's, 10¾c. to 10.7c.

Copper—Lake Copper has been sold at 11.60c. to 11¾c.; Casting Copper is held at 10¾c. to 11¼c.

Lead—Demand is quiet. In quantities purchases can be made at 4.10c.; offerings are 4.15c.

Lard Oil—Prime City is quoted at 62c. to 63c.; Western on spot at 61c.

Spelter—The market continues dull, and there has been a decline to 4.70c. for carload lots.

Tin—Sales by the ton for August delivery have been made at 20 45c.

✻WANTED✻

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. Seven words make a line, and the address as desired to appear should be included. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Mech draftsman, good designer, wants situation. Address BOX 71, AMERICAN MACHINIST.

Wanted—Position by exp'd draftsman, N. Y. City; references furnished. Box 73, AM. MACHINIST.

Mech. eng. will represent mach. builders in Philadelphia. Box 69, AMERICAN MACHINIST.

Mechanical draftsman wants position. Box 57, AMERICAN MACHINIST.

Wanted—Agents in every shop for machinists' fine tools, sliding calipers, etc. E.G.Smith,Columbia, Pa.

Wanted—Position as foreman boiler maker; reference furnished. Foreman, AM. MACHINIST.

Draftsman desires position as an assistant. Address Draftsman, AMERICAN MACHINIST.

Mechanical draftsman desires position, references. Address BOX 72, AMERICAN MACHINIST.

Wanted—Competent foreman for foundry in North Carolina. Both brass and iron. Address Mecklenburg, AMERICAN MACHINIST.

Position wanted by graduate of Cornell University as draftsman; 2 years' machine shop experience. Address S. C., AMERICAN MACHINIST.

First-class mechanical draftsman and designer desires to make a change. Address Reliable, 27, AMERICAN MACHINIST.

Wanted—Position by designer of hydraulic machinery and tools; 8 years draftsman, 8 machinist and tool maker. BOX 68, AMERICAN MACHINIST.

Wanted—Position as foreman pattern maker; 25 yrs. exp. and 16 yrs. foreman; best econ'c methods; eng. & mach. work; best refs. Box 51, AM. MACH.

Wanted—Draftsman with technical education, at present employed in electrical work, desires a change. Tool work preferred. Box 74, AM. MACH.

Wanted—A position as instructor in a manual training, trade or tech college; wood-work, pattern making and molding a specialty; best refs. for practical and theoretical ability. Box 50, AM. MACH.

Wanted—Foreman to take charge of machine shop in Canada, manufacturing stationary and marine engines; none but first-class exp'd man need apply to Box 49, AMERICAN MACHINIST.

First-class mechanical draftsman (graduate Sweden, age 24), with 4 years' exp. in this country, thoroughly competent in eng and pump designing, desires engagement. Box 67, AMERICAN MACHINIST.

Wanted—A capable and practical machinist, one having experience on machine tool work. A good opportunity for a thoroughly reliable and competent man. Address BOX 70, AMERICAN MACHINIST.

Position wanted by a man of long and successful experience as machinist, foreman and supt.; good draftsman and designer of tools and machinery. Z., care Cochrane, 131 E. 17th St., N. Y. City.

Wanted—1st-class man, successful in managing men, and thoroughly acquainted with screw machine work, to take superintendence of a machine screw factory in Western city. Address Queen City, AMERICAN MACHINIST.

Wanted—A thoroughly exp'd time-keeper, who can keep time and cost account in shop employing two or three hundred hands. Must understand piece-work accounts. State age, salary expected, and experience. Address Box 61, AM. MACHINIST.

Wanted—A first class man who thoroughly understands gear cutting and milling to have charge of about ten men. Also a first-class man to take charge of about twenty lathe hands. Both must be active and well up in their business. Address Gears, AMERICAN MACHINIST.

Wanted—Superintendent for one of the largest, most progressive and best known machine tool concerns in the United States; will have entire charge of works; none need apply except those now in similar position with one of the standard tool builders of the country; must be progressive, and in touch with the most modern shop practice. For the right man this is the opportunity of his life; much more back of it than can appear in an advertisement; all communications strictly confidential. Box 31, AMERICAN MACHINIST.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d-hd lathes & planers. S. M. York, Clev'd, O.

Auto. Steam Flue Cleaners. Kelley Co., Erie, Pa.

Presses, Wire Form'g Mchy. Am. Tool Wks, Clev, O.

Bolt Cutter Heads a Spec'y. Am. Tool Wks., Clev., O.

Best Bolt Header in the world for $50. Address C. H. Baush & Sons, Holyoke, Mass.

Screw-cutting lathe, 9"x54", $45; engine, 2 horse, $25; on sale. 229, AMERICAN MACHINIST.

Engines, special and gen. mach'y designed; ideas developed. A. W. Jacobi, 136 Liberty St., N. Y.

Special machinery designed and built. C. F. Langston & Co., 70 N. 4th St., Philadelphia.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Design & superintendence of mach'y. Drawings, etc., made. Claud Mantle, 598 E. 134th St., N. Y.

Wanted—A specialty to manufacture either heavy or light work. We have splendid facilities. Address "Manufacturers," Rockford, Ill.

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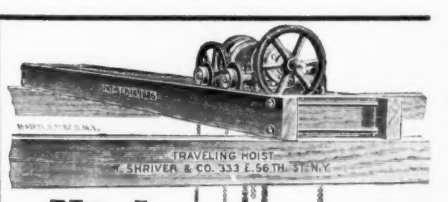

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NEW CASTLE, PA.,
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For terms, apply to
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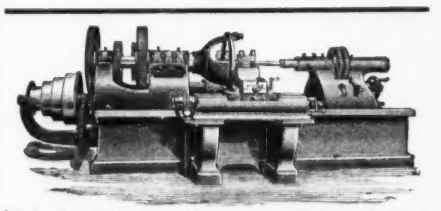

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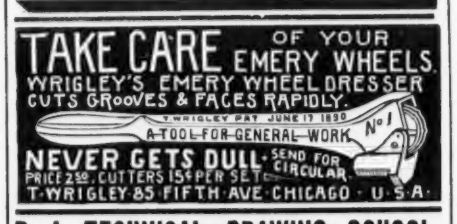
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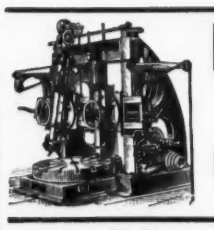

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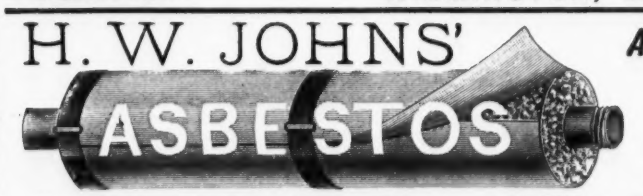

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✣ MISCELLANEOUS WANTS ✣

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Agency wanted—A young, energetic mechanical engineer wants to represent some good firms for Buffalo and surroundings. Box 44, care AM. MACH.

Wanted—Hardware specialties to build. Send 25 cents for "Eureka Knife and Shears Sharpener." W. A. Smith & Co., 227 Eddy Street, Providence, R. I.

For Sale—All the machinery and fixtures of a machine shop and foundry situated at Whitesboro, N. Y. Lists sent on application to B. T. Babbitt, New York City.

Wanted—To rent, or would run by the ton a foundry that will give steady employment to ten men, making light machinery. D. F. Slade, Worcester, N. Y.

Wanted manufactured, micrometer scale described in AM. MACH. of Aug. 18. Numerous inquiries received. Address Chas. Sperry, 12 W. 31st St., N.Y.

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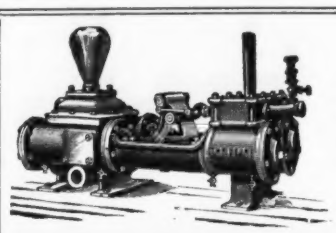

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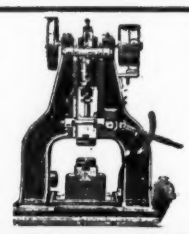

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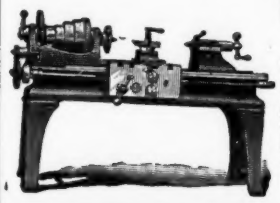

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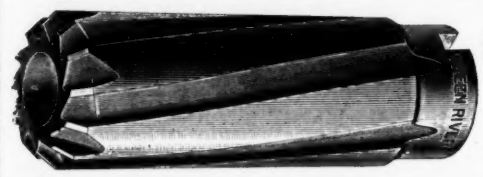

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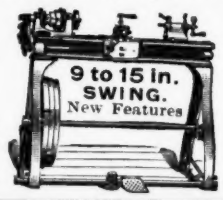

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18 in. x 6, 7 & 8 ft. do	New & do do do	
17 in. x 8 ft. do	do do do	
16 in. x 6 & 8 ft. do	do do do do	
15 in. x 6 & 8 ft. do	do do do do	
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9 & 12 in. Stroke Slotters.
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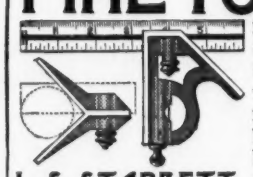

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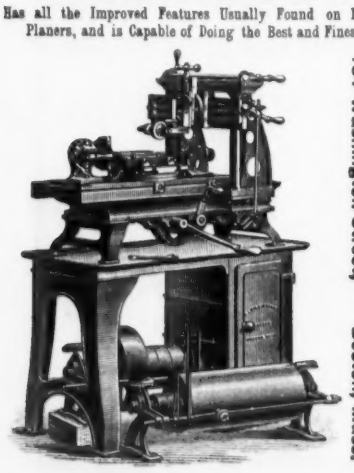

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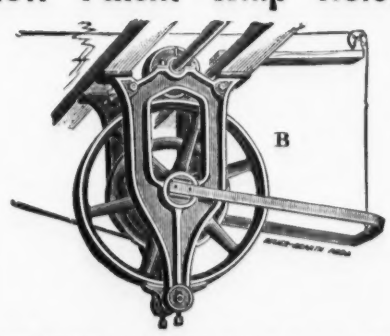

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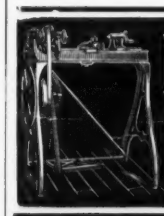

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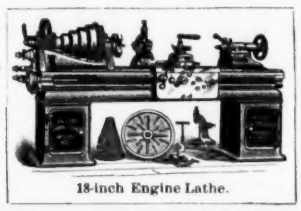

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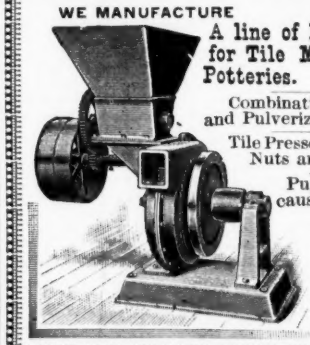

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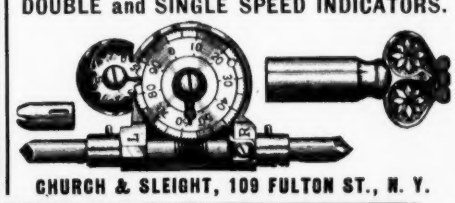

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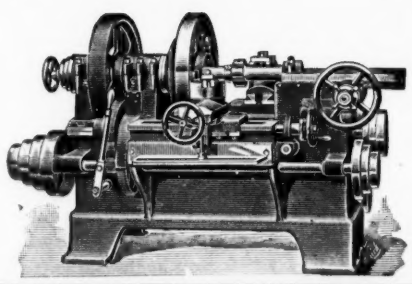

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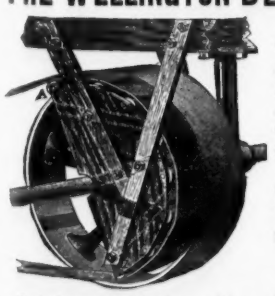

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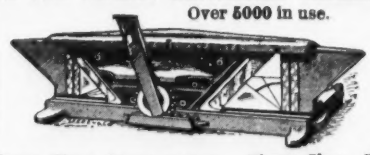

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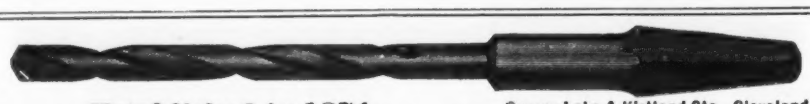

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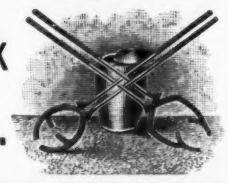

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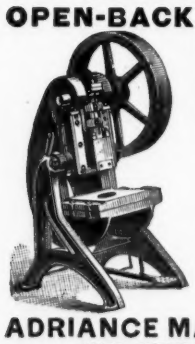

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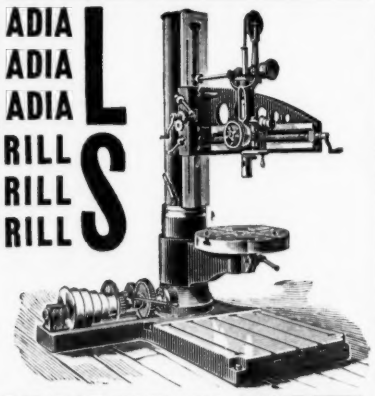

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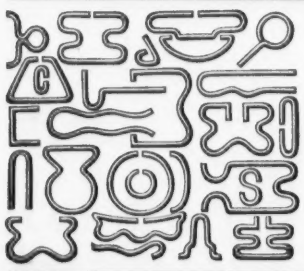

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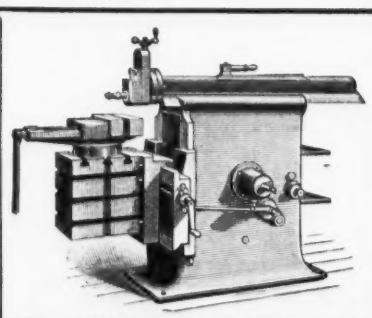

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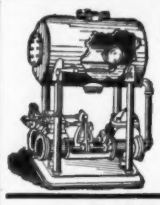

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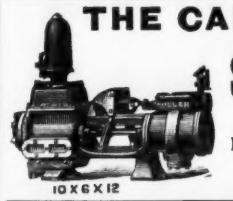

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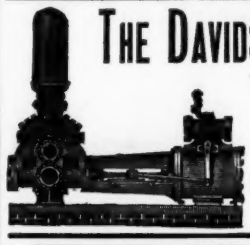

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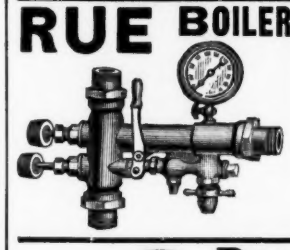

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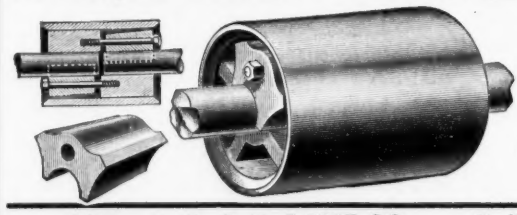

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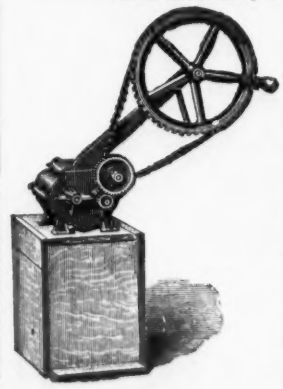

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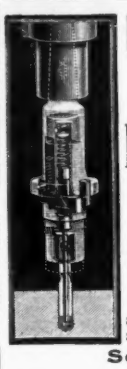

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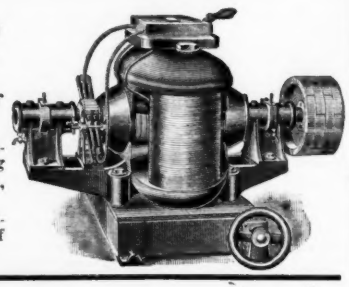

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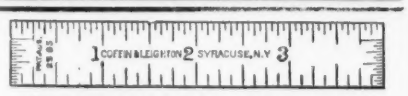

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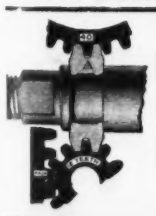

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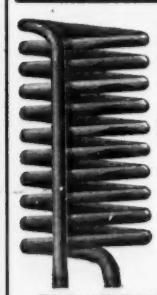

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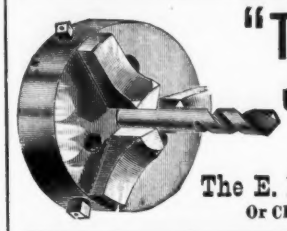

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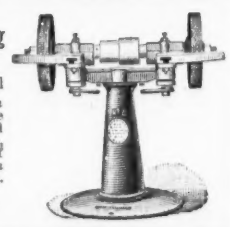

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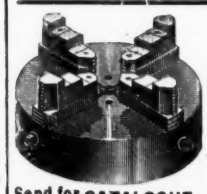

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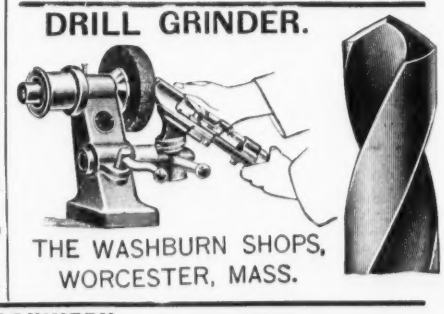

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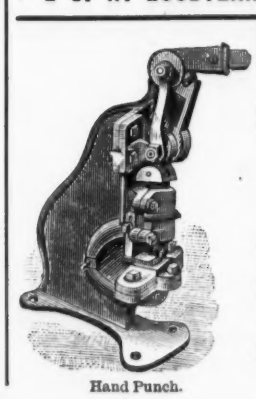

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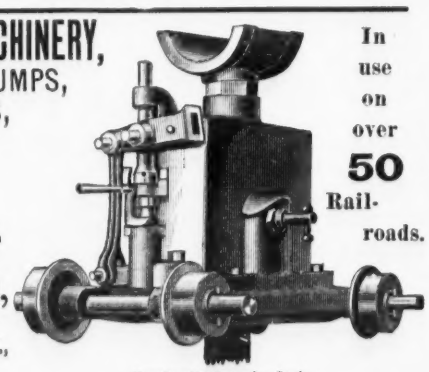

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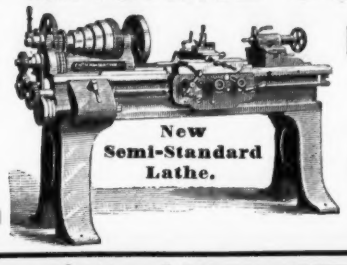

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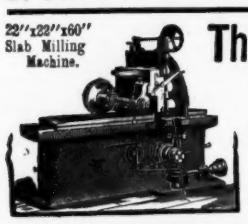

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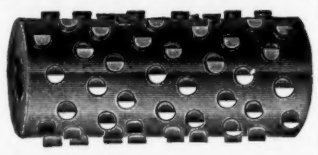

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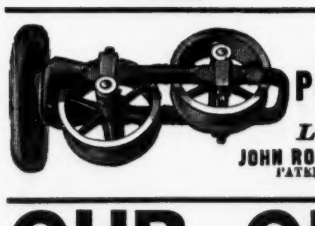

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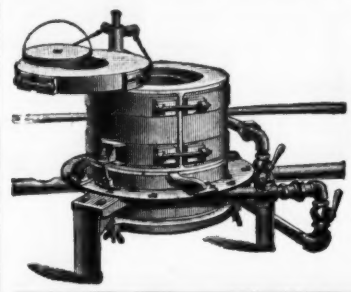

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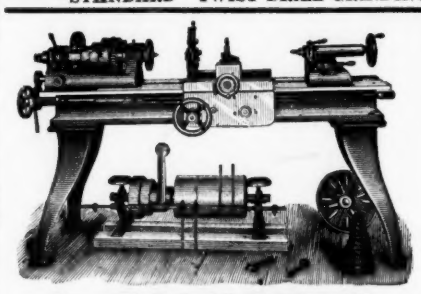

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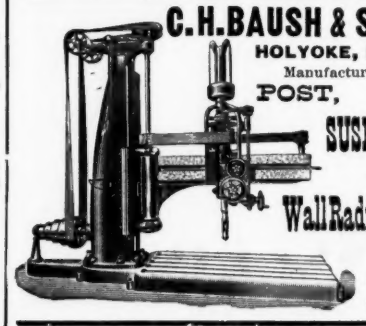

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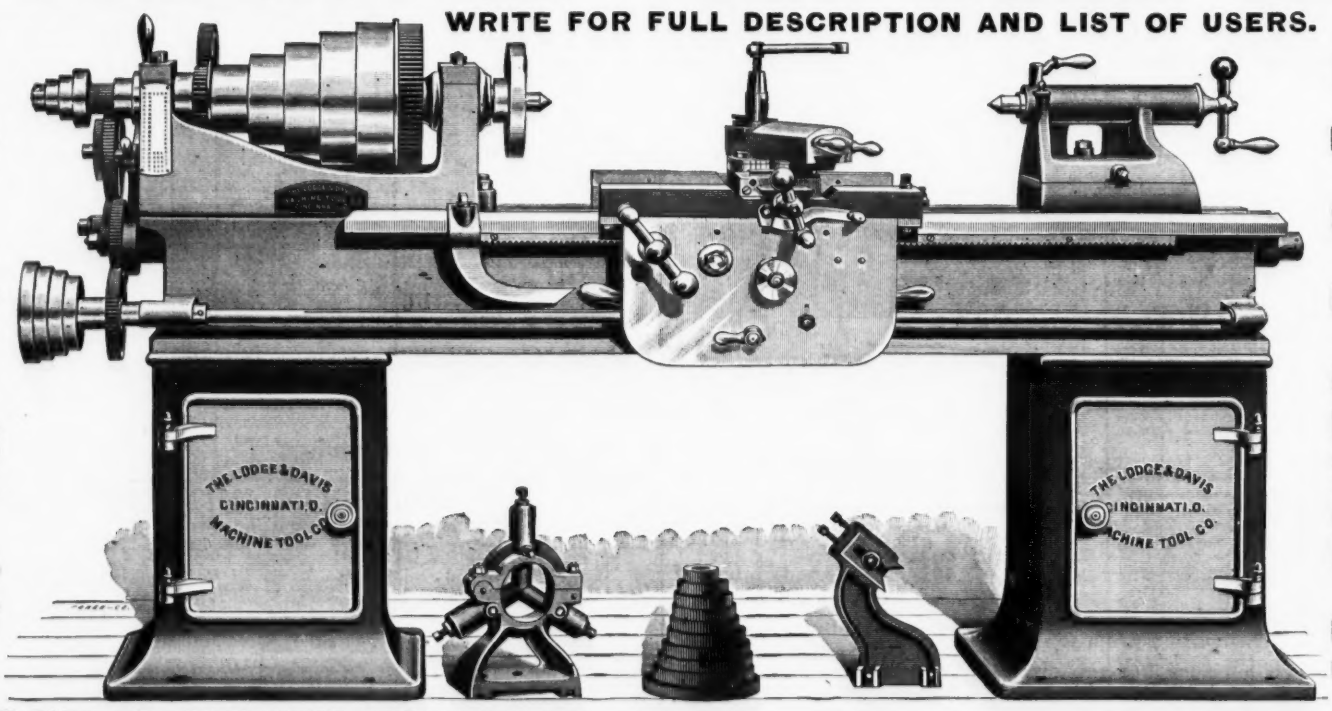

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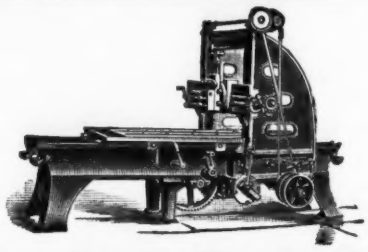

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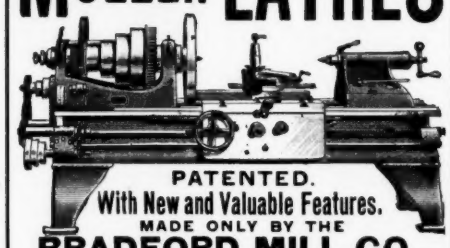

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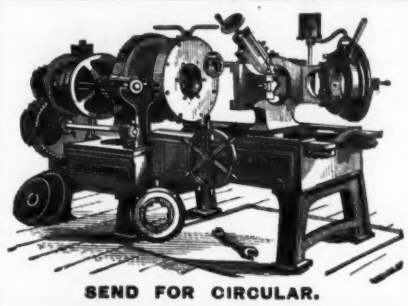

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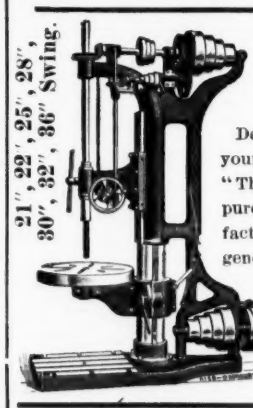

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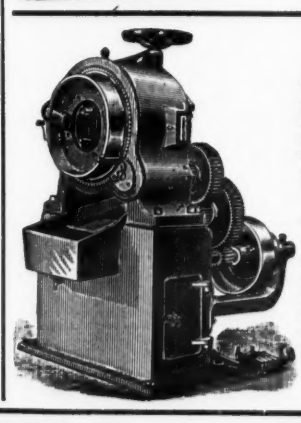

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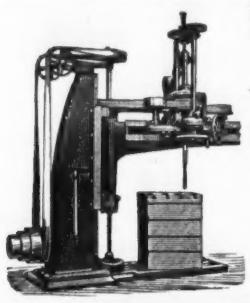

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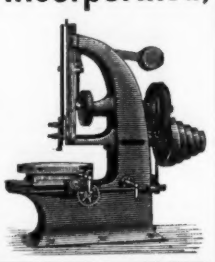

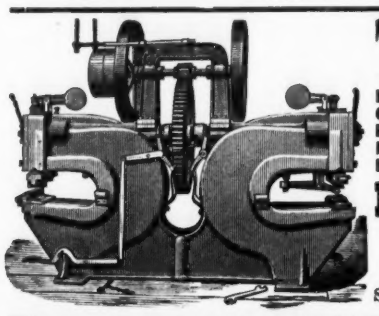

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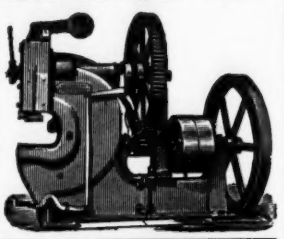

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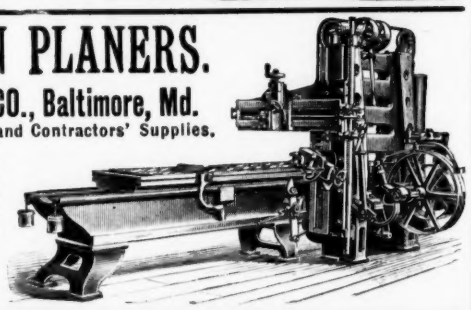

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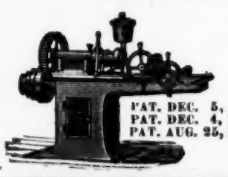

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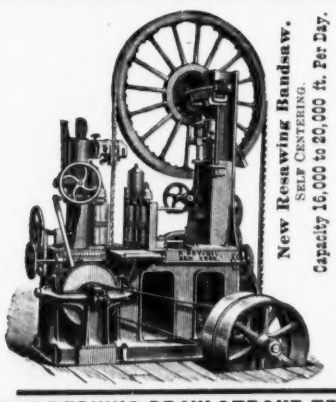

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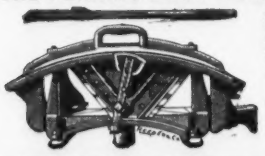

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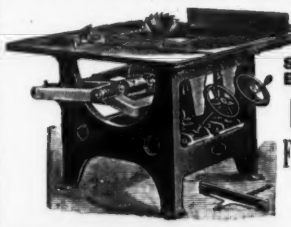

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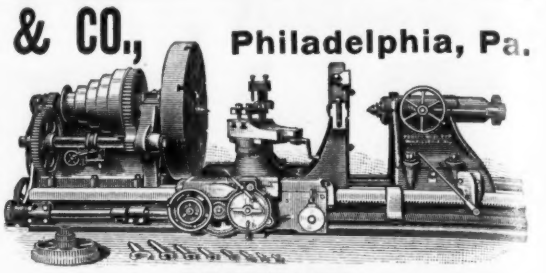

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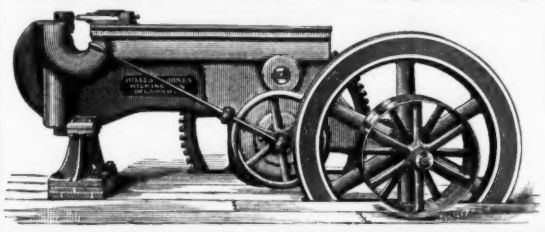

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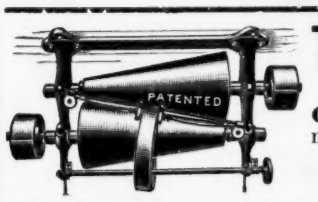

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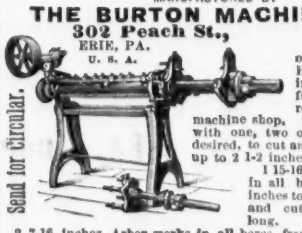

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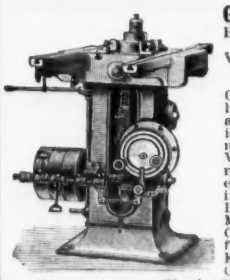

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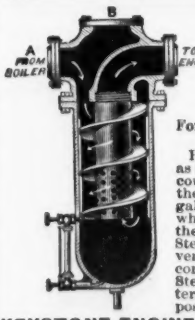

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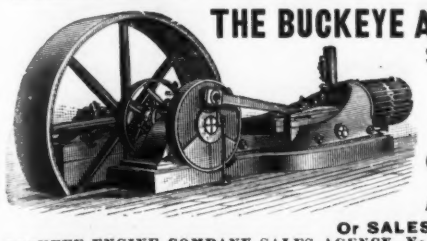

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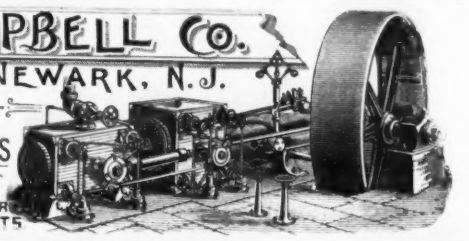

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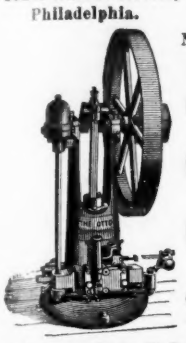

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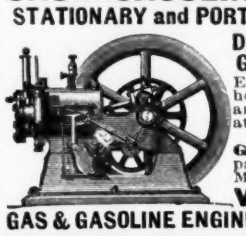

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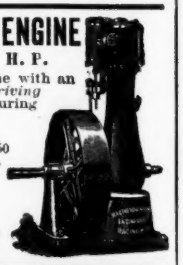

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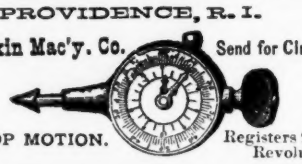

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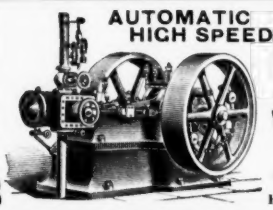

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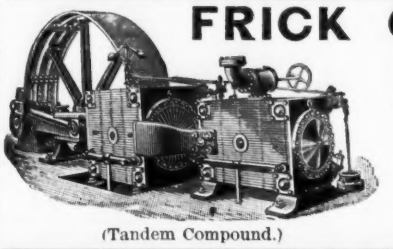

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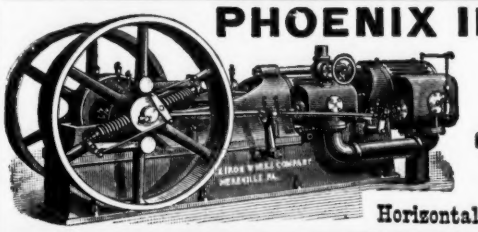

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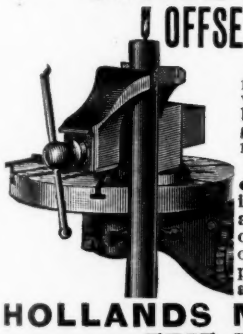

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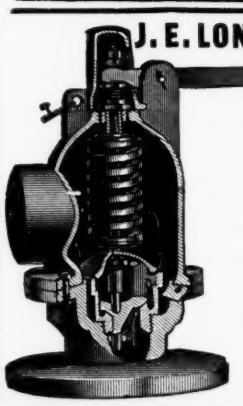

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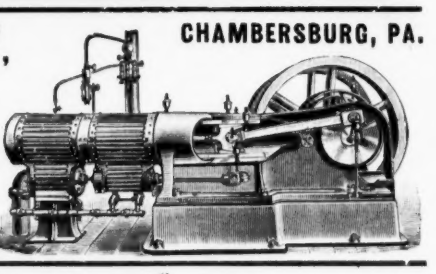

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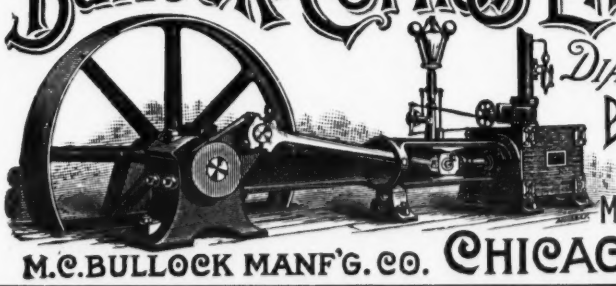

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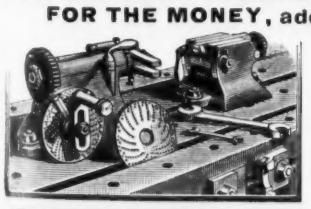

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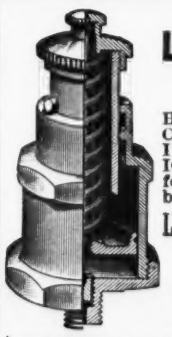

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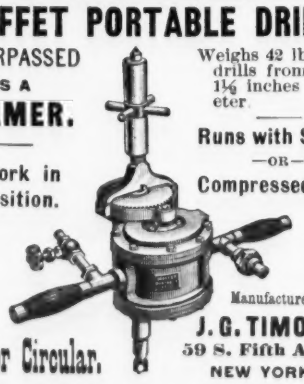

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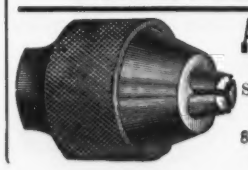

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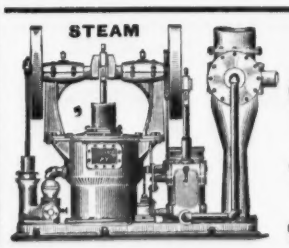

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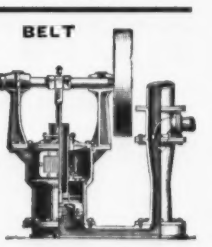

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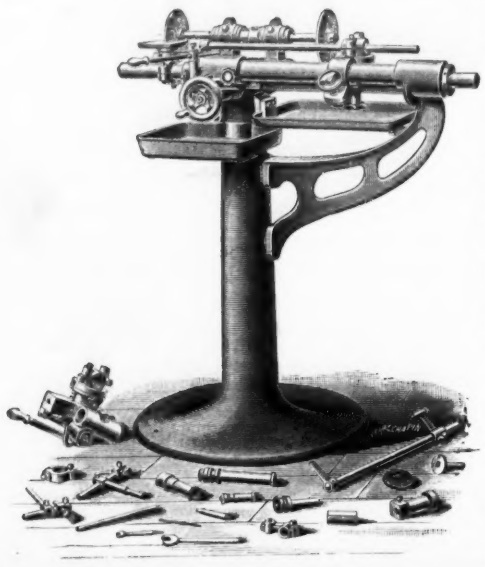

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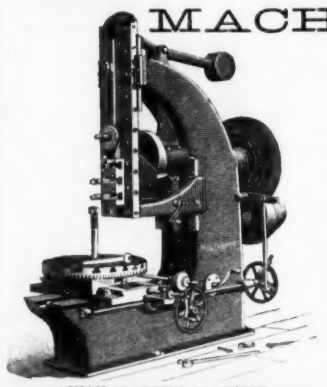

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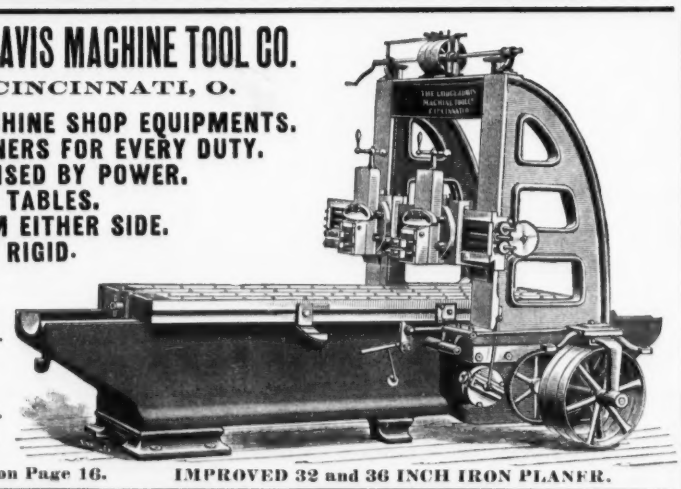

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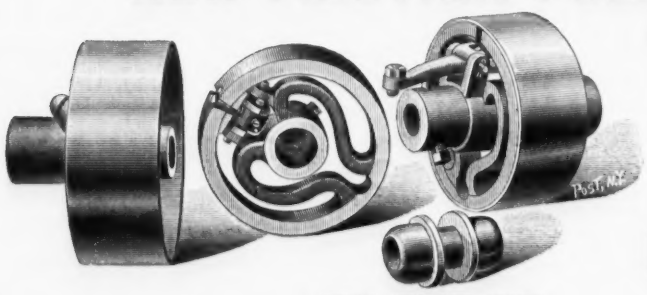

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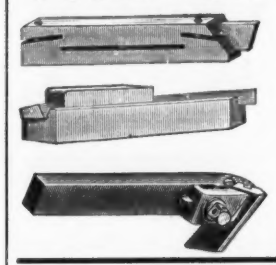

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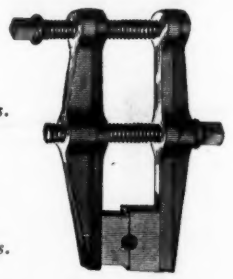

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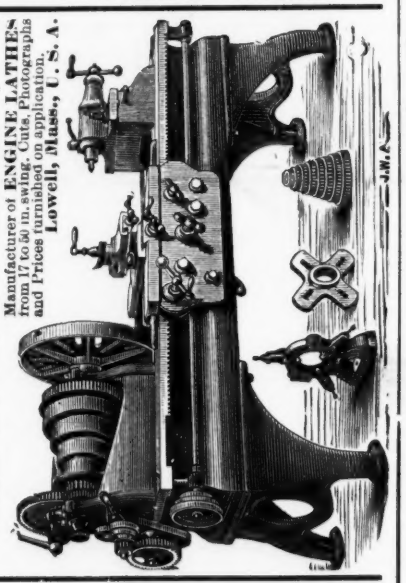

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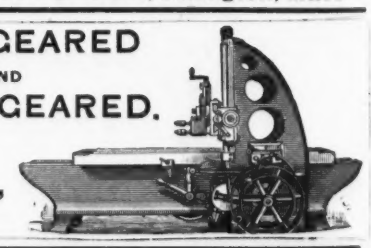

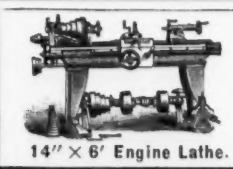

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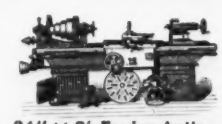

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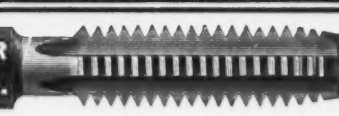

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